ECONOMIC CONTRIBUTION OF CO-PERATIVE MANUFACTURING SOCIETY IN INDIA

BY

PAVITHRA. J

(14PEC006)

A DISSERTATION SUBMITTED TO

AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN

COIMBATORE-641043

IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE

DEGREE OF MASTER OF ARTS IN ECONOMICS

APRIL 2016

ECONOMIC CONTRIBUTION OF CO-OPERATIVE MANUFACTURING SOCIETY IN INDIA

BY

PAVITHRA. J

(14PEC006)

A DISSERTATION SUBMITTED TO

AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN

COIMBATORE-641043

IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE

DEGREE OF MASTER OF ARTS IN ECONOMICS

APRIL 2016

CERTIFIED AS BONAFIDE RESEARCH WORK

23/4/16

SIGNATURE OF THE HEAD OF THE DEPARTMENT

M. Manoharan
22/4/16

SIGNATURE OF THE GUIDE

ACKNOWLEDGEMENT

ACKNOWLEDGEMENT

The investigator would like to place her deepest sense of gratitude and indebtedness at the feet of **God Almighty.**

The investigator extends her thanks to **Dr. T.S.K. Meenakshi Sundaram, former Chancellor,** Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for allowing her to carry out all her work relating to research in this institute.

She places her deepest sense of gratitude to the **Chancellor Dr.P.R. Krishna Kumar,** Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for the guidance given in carrying out the research work.

The investigator conveys her profound gratitude to **Dr. (Tmt) Premavathy Vijayan, Vice Chancellor (i/c),** Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for the academic support given for the study.

Her sincere thanks are due to **Dr. (Tmt) A.Venmathi, Registrar (i/c),** Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for her enthusiastic support throughout the period of research work.

The investigator extends her heart-felt thanks to **Dr. (Tmt) P. Ambiga Devi, Dean, Faculty of Humanities and Professor in Economics,** Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for her advice and encouragement during the course of the study.

She is also grateful to **Dr.K.T Geetha, Professor and Head of the Department of Economics,** for her motivation and guidance in carrying out the research.

The investigator wishes her sincere thanks and deep sense of gratitude to her supervisor **Dr. (Mrs.) M. Manonmani, Professor in Economics,** Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for her advice and encouragement throughout the course of her investigation. She is greatly indebted to her for the successful completion of the thesis.

The investigator also wishes to convey her heartfelt thanks to the faculty members in the Department of Economics, Avinashilingam Institute for Home Science and Higher

Education for Women, Coimbatore, for all their advice and encouragement during the course of her study.

The investigator extends her thanks to the **Librarian and office Staff** of Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for their valuable support in the completion of the work.

The investigator is highly thankful to **Her Friends**, for their support and co-operation in carrying out the study.

The investigator expresses her deepest sense of gratitude to her **Parents**, for their blessings and motivational words for successful completion of the study.

LIST OF CONTENTS

LIST OF CONTENT

CHAPTER NO	TITLE	PAGE NO
	LIST OF TABLES	
	LIST OF FIGURES	
I	INTRODUCTION	1
II	REVIEW OF LITERATURE	6
III	METHODOLOGY	30
IV	RESULTS AND DISCUSSION	39
V	SUMMARY AND CONCLUSION	63
	BIBLIOGRAPHY	69
	APPENDICES	78

LIST OF TABLES

LIST OF TABLES

TABLE NO	TITLE	PAGE NO
1	GROWTH OF NUMBER OF FACTORIES	40
2	PERCENTAGE OF GEOGRAPHICAL AND MARKET INDUSTRIAL CONCENTRATION	43
3	PER FACTORY INPUT SHARE (IN PERCENTAGE)	45
4	INDICES OF PARTIAL AND TOTAL FACTOR PRODUCTIVITY	46
5	INDICES OF WAGE RATE AND EARNINGS PER EMPLOYEE	49
6	INDICES OF FACTOR INTENSITY	50
7	INDICES OF FACTOR EFFICIENCY	52
8	FACTOR'S SHARE IN TOTAL INPUT	53
9	TRENDS IN MP_L RATIOS	55
10	TRENDS IN MP_K RATIOS	56
11	TRENDS IN $MRTS_{LK}$ RATIOS	57
12	ESTIMATES OF PRODUCTION FUNCTION	58
13	MULTIPLE LINEAR REGRESSION CO- EFFICIENTS	59
14	CO-EFFICIENTS OF IMPORTANT THEORETICAL LAW/HYPOTHESES TESTED	60
15	CO-EFFICIENTS OF CORRELATION	61
16	REGRESSION CO-EFFICIENTS	62

LIST OF FIGURES

LIST OF FIGURES

TABLE NO	TITLE	PAGE NO
1.	GROWTH OF NUMBER OF FACTORIES	41
2.	PERCENTAGE OF GEOGRAPHICAL AND MARKET INDUSTRIAL CONCENTRATION	44
3.	INDICES OF PARTIAL AND TOTAL FACTOR PRODUCTIVITY	48
4.	FACTOR INTENSITY	51

INTRODUCTION

I.INTRODUCATION

Industrialization becomes instrumental in bringing about such far reaching and all embracing changes in less developed economies in several ways. Generally, these countries are characterized by the existence of surplus labour. Thus, it opens avenues for employing the surplus labour. The modern industry can directly be helpful to raise productivity of an economy. This is due to better organization and technology. It improves productivity of the agricultural sector by providing it with improved and scientific inputs. Industrial growth results in siphoning off surplus labour from agriculture on the one hand, and supply of modern agricultural implements and inputs on the others, leading to technological and organizational changes as well productivity increases in the agricultural sector. The nature of foreign trade also undergoes a change with industrialization of a country. It has been noticed that foreign trade of LDCs is dominated by primary products but industrial development may lead to a change in the composition and direction. Another crucial role played by industrialization is that it promotes export, resulting in favourable balance of payments. Generally, B.O.Ps is most unfavourable in the early stages of development due to import of technology, capital goods and raw materials. With industrialization, there is generation of export surplus.

Industrialization promotes capital formation as a crucial catalyst of economic prosperity. Truly, industrial development brings in good profit and more income which in turn leads to greater saving and investment. The process of industrial sector brings higher standard of living of people. Industrialization involves the organization of production in business enterprises which is characterized by specialization and division of labour. Industrial development is also helpful for the defense of a country. The more an industrialized country, more arms and ammunition it can produce and strengthen its defense. Due to industrialization, there is proper utilization of natural resources with the adoption of latest and modern techniques of production. It leads to higher national income and per capita income, increased employment and greater production, which further leads to national prosperity. As industrialization proceeds, economies of scale and inter-industrial linkages (complementarities) become more pronounced. It also leads to the creation of economic surplus in the hands of industrial producers for further investment. The industrial sector, which possesses a relatively high marginal propensity to save (MPS) and invest, contributes

significantly to the eventual achievement of self-sustaining economy with continued high levels of investment and rapid rate of increase in income and industrial employment.

Industrialization also becomes instrumental in the spreading of industrial culture, work ethics, scientific temper, accumulative drive, all of which directly or indirectly contribute to the growth of investment and income. However, the chief feature and the core of industrialization remain in the increase in productivity and efficiency in all sectors and at all levels of the economy. Industrialization acts as an instrument both for creating capacity to absorb excess labour power and to diversify the market required at higher stages of economic development. In planning for development, industrialization was assigned a crucial role because it was perceived to be the dynamic force to galvanize the rest of the economy. An assessment of the overall Indian experience of industrialization is not an easy task. One of the key issues that arise in making any overall assessment of the Indian industrial experience is that of the growth and productivity performance of Indian industry.

The Industrial economy of the country today is passing through vast upheavals. The responsibility for rapid industrialization development only on the part of the government is not possible immediately and is a long term phenomenon because limited resources and diversified socio economic activities. Whereas the need of the hour is speedy industrial development. The private sector is mainly concentrating on medium and large-scale industries yielding profits. This sector mainly guide exploitation without consideration of public interest. On the other, the public sector in mainly concentrating on public utilities, strategic production and industries of national importance. This sector is known for its bureaucratic is efficiency, delay, incurring of losses etc. The co-operative sector is mainly undertaking production activities of village industries, cottage industries, small scale units and Agro-based industries. This sector is most suitable for organizing there industries and other crafts of artisans and to preserve traditional industries.

The co-operative sector acts as a balancing factor between private and public sector. Industrial co-operative play an important role in the process of industrialization in India. The importance of the co-operative sector as one of the industrial sector cannot be over emphasized. The industries in co-operative sector represent a new dimension in India’s industrial structure.

The socialistic pattern of society implies of decentralized units. The establishment of a large number of decentralized industries offers vast scope for the application of co-operative

principles. In a country like India where capital is shy, low rate of capital formation, literacy among artisans, economic imperfection, poor enterprise and organizational ability are the associated features. The co-operate sector has emerged and played an important role in solving many of these problems. The sector combines in itself the merits both of public and private sectors and eliminates their defects. Co-operative industrial sectors provides a substitute for the profit motive in business organization, ensures equitable distribution of income and wealth, curbs monopolistic concentration and promotes decentralization in industrial structure and balanced regional development, elimination of waste and retention of profit are other advantage of the co-operative sectors.

Productivity growth is a crucial factor in determining growth of an economy. The study of productivity becomes imperative in view of the limited availability of factors of production, particularly capital. Productivity is the marginal contribution of a factor to the output growth of a product. The productivity improvements along with the increase in the quantities of factors will also be contributing an additional source of output increase. Productivity growth is necessary not only to increase the output, but also to enhance the competitiveness of an industry both in the domestic and international markets. Besides, the productivity growth enhances the export competitiveness of a country. The estimation of factor productivity will be very useful to evaluate the variations in the performance of an industry over a period of time. The prosperity of new developed nations has been attributed mainly to the sustained growth of its total factor productivity.

Production function approach to productivity measurement is more advantageous because it can handle the problems arising due to non- separability of inputs and output, non-neutral technical change, non-constant returns to scale and non- Proportionality of input prices of their respective marginal productivity in an explicit manner. A production function an shows the technological relationship between the maximum output obtainable from a given set of inputs and the relationship between the inputs themselves in the in the existing state of technological change. In this approach to productivity measurement the various components of productivity can be estimated directly by econometric estimation. The production function can be used to measure the efficiency of production technology, returns to scale, the degree of economies to scale, the degree of capital intensity of (technology) and the degree of substitution between factors of production.

One of the several objectives of economic reforms process is to achieve balanced growth of industry in the nation and reduce the inequalities in the industrial base of the nation. The development of the industry has been identified as a prime requirement for exploiting backward linkages to agriculture and forward linkages to overall economy. Thus, for regional development in India, a need of developing manufacturing or industrial base of each state has been identified. In this endeavor, government announces different packages over a period of time to distort the producers‟ investment choices in different region. Thus, for balance growth, the concentration of industrial activities must decline over a period of time and industrially backward states must attract good share in total output of the nation. Against this backdrop, it becomes mandatory to analyze the concentration trends in Indian manufacturing sector. The analysis will help to identify the effectiveness of balanced growth strategy of Indian policy planners.

Market concentration or, more specially, the degree of seller's concentration in the market is an important element of the market structure which plays a dominant role in determining the behavior of a firm in the market. By market concentration we mean the situation in which an industry or market is controlled by a small number of leading producers who are exclusively or at last very largely engaged in that industry. Two variables that are of relevance in determining such situation are (a).The number of the firms in industry, and (b).their relative size distribution. How these two dimensions cause different form of the market structure having vital consequences for the pricing and output decision of the firm are important. In the context of industrial economics, however, the implication of market concentration are far wider than whatever find in the theory of firm, for example, concentration in the ownership of the industry, concentration of decision making power etc all being elements of market concentration, may have considerable impact on the market performance of the firm such as profitability, price cost margin, technical progress and content. These links are to be understood properly, because all of them are very much relevant from the point of view of decision making and regulation of industries. In this study, an attempt has been made to analyze the level of industrial concentration in Indian manufacturing sector of that region.

Geographic concentration of a specific industry reflects the distribution of its regional shares. A highly concentrated industry will have a very large part located in a small number of regions. Concentration of industries and specialization of regions have been measured on the basis of the Gross Value Added and the number of employed population, both very

popular in most empirical studies on this topic. Many studies in the regional economics literature have approached the issues of both industrial specialization of regions/countries and geographic concentration of industries, considered by many as "two sides of the same coin". Regional specialization expresses the territorial perspective and depicts the distribution of the sectoral shares in one region, usually compared to the rest of the country, while geographic concentration of a specific industry reflects the distribution of its regional shares. An attempt has been made to analyze the

1. Trends in the growth of number of factories, wages and earnings, factor intensity, factor efficiency, factor's share in total input, geographical and market industrial concentration, partial and total factor productivity indices.
2. Production function estimates and sources of productivity growth.
3. Relative importance of technology on wage, output and labor productivity.
4. Approval /disapproval of important theoretical law/hypotheses.
5. Analysis of elasticity-wage, output and employment elasticity.

It is hoped that the findings and conclusions emerging out of this study would be of immense use to the policy makers of this particular area and evolve policies for the future growth.

REVIEW OF LITERATURE

II.REVIEW OF LITERATURE

The review of literature relating to the current study on "Economic Contribution of Co-operative Manufacturing Society in India" is discussed under following headings:

1. Financial Performances of manufacturing industries.

2. Productivity of manufacturing industries.

3. Production function estimates of manufacturing industries.

4. Industrial concentration of manufacturing industries.

5. Efficiency of manufacturing industries.

1. Financial Performances of manufacturing industries

Nikham (1976) in his study on "Financial Strength of Sugar Co-operatives- A Ratio Analysis Approach" measured the financial strength of sugar co-operatives with the help of ratio analysis. He measured the long term and short-term financial strength of four sugar factories in Aurangabad District. He concluded that Debt Equity Ratio displayed high-geared capital structure and net worth ratio support that these societies were relying more on borrowed funds for development and expansion programme. They have very little self-financing programmes of their own.

Nadakarani (1984) conducted a study on "Management of Co-operative enterprises in the context of the democratic set up". The study revealed that this relationship was not only limited to the capital invested but also extended beyond share holding to the utilisation of services rendered by the cooperatives and more members should be brought into the fold of cooperatives so that they could become economically viable. He has also suggested co-operatives could bring economiecs of scale.

Ghuman and Manga et.al (1987) in his study on "Performance of Co-operative Sugar Mills in Punjab" focused on management, financial performance and physical performance. Financial performance was analysed on the basis of share capital and profit and loss account over a number of years. Physical performance was measured on the basis of various indicators such as sugar cane crushed sugar production in quantity and value. They found that all the units studied were running at a loss.

Rayudu (1988) in his study on "Industrial Co-operatives - A Regional Synthesis to A.P." analyzed the financial performance, economic and organizational viability, contribution of societies in terms of production, employment and earnings in addition to the role of the state in promoting them. He concluded that the position of industrial co-operatives in Andhra Pradesh was not satisfactory. Most of the industrial co-operatives have been functioning on losses continuously for several years. These societies had been trading heavily on borrowed capital. He suggested that if the state government, the co-operative department, its office bearers and members make sincere efforts to improve the performance of these societies, their operational efficiency and financial performance would be considerably enhanced.

Isbella Rani and Krishnamoorthi (1993) conducted study on "Rural Industrialisation - The case of Coir Industry" in Pollachi Taluk of Coimbatore District in order to analyse investment pattern and employment pattern in the coir industry. It revealed that the labour share to the total cost accounted for 10.39 per cent. It could be seen that the crushing units enjoyed more profits than the fibre units, which implied that the vertical integration was more profitable than with a single operation unit. The results indicated the potential for increasing the turnover using more and more of raw materials like coconut husk. Similarly there existed potentiality for increasing labour and wage rate. The total labour force for different units worked out to 14.32 labour days per units per day. In the case of defibring units with conveyers 17.35 labour days per unit in the case of curling units. The units also provided employment for both men and women.

Rajagobal (1995) in his study on "Organisation and management of women coir fibre co-operatives" analyzed the organizational and managerial perspectives of all women coir co-operatives. For the purpose of the study 60 women members from all women coir fibre societies of east Godavari district of Andhra Pradesh were selected. The study revealed that improper accounting systems, low wage structure and lack of infrastructure were some of the reasons for the failure of the societies. The study suggested the need for training to both members and workers to provide quality of goods.

Seema (1999) in his study on "Social Development and Women Co-operative Sector" found that the position of women's industrial co-operatives in Kerala was not satisfactory. Out of 305 women's co-operatives, only 39 made profit. After an analysis of the reasons, she concluded that they would become profitable only if they freed themselves from the clutches

of traditional methods and adopted modern technology. She also emphasized the need for co-operative education and training among women.

2. Productivity of manufacturing industries

Manonmani and Geetha (2012) in their study on "Wage-productivity relationship in the manufacture of leather and leather products in Tamil Nadu" attempted to analyze the problem at the regional level by concentrating on one particular state namely, Tamil Nadu. The reference period of the study was from 1979-80 to 2007-08. In order to clearly understand the links between wages and productivity in selected industries, this study had used a simple econometric analysis namely, step-wise regression model. The function showed that wage rate (Lnw) in the manufacture of leather and leather products was positively related to labour productivity (LnGVA/L). The increase in Gross Value Added (LnGVA) significantly reduced the real wage rate (Lnw). However, positive relationship was noted between capital intensity (LnFC/L) and real wage rate (Lnw) and the institutional factors measured in terms of trend variable (LnT) had a significant positive impact on real wage rate (Lnw).

Manonmani and Nithya (2012) studied the "Determinants of industrial productivity in India before and after liberalization". The reference period chosen for the study covered both pre and post liberalization period. The pre liberalization period covered between 1972-73 and 1990-91 and post liberalization period between 1991-92 and 2009-10. Discriminant function was applied to find out the dominant factors which determine the productivity in these states. It was found that time factor was the first dominant factor to determine the pre and post liberalization period labour productivity. The pre and post liberalization period capital productivity was dominated by wage rate. In determining the total factor productivity net value-added was the prime factor between pre and post liberalization period.

Manonmani (2012) made an attempt to analyse "Determinants of productivity based on the indices of partial and total factor productivity in rural, urban and aggregate industries of India" for the reference period between 1998-99 and 2007-08. Multiple linear regression models were applied to analyse the data. To find out the average annual growth rate in partial as well as total factor productivity, exponential growth function was applied. It was found that the trend rates of partial and total factor productivity indices were positive. The analysis also revealed an inverse relationship between labour productivity and unit- labour cost in these industries. Significant relationship existed between all forms of productivity indices and

the major factors which influence productivity. It was concluded that productivity of capital and total factor productivity may be taken into account along with labor productivity while granting wage increase so that wage increase is not of inflationary nature. In order boost the total factor productivity growth there is a pressing need to harmonies the industrial relations with workers and management In this context amendments in labour laws, greater participation of workers in management and rehabilitation of workers especially in case of disinvestment of public sector units are some spheres which require quick attention of policy makers to create conducive environment.

Baliyan Sandeep Kumar and Baliya Kavita (2015) in their study on "Determinants of firm-level performance: A study of Indian manufacturing and service sectors" The made to study an attempt the firm level performance of manufacturing and service sectors in India in terms of the level of technical change, technical efficiency change, and productivity growth. The study used the Malmquist Productivity Index (MPI) model to estimate the total factor productivity growth index for manufacturing and service sectors with decomposition into catching up effect and the innovation effect of the common set over the study period during 1991–92 to 2010–11. For analytical convenience, this period has been divided into two sub-periods, namely, 1990–91 to 1999–2000 (Phase-I: Liberalization) and 2000–01 to 2010–2011 (Phase-II: Liberalization). The study also examined the total factor productivity growth (TFPG) of manufacturing and service sectors and the factors determining the level of total factor productivity growth of both the sectors with the help of the regression model. The study found that for the enhancement of TFPG the level of openness, raw material, energy, and advertising, profit margin, and investment are the major contributions.

Fare Grosskopf and Lee (1995) made an analysis of "Productivity in four Taiwanese manufacturing industries" during 1978-1989 by decomposing the Malmquist productivity change index into technical change and technical efficiency change. Further this method was also compared to traditional and parametric approaches. The results of this study suggested that TFP growth in the long run was totally because of technical change. On an average the liberalization period's TFP was higher than the pre liberalization period. Further results suggested that technical efficiency and technical progress could not move together and technical change was positively related with research and development.

Ambili Kumar (1999) in his study on "Productivity of coir co-operatives in Kerala" found that the productivity of the labourer declined because of the yam manufactured in

mechanized ratts was not treated as best quality but as second grade by the coir fed, and no coir society use the all 100 mechanised ratts which was provided by under the ICDP to each industrial unit without considering the actual requirements. The productivity of the workers came down not only because of lack of experience, but because of the over burden of work assured by them also. The study also found that the problem of power shortage and the resultant power cut has its own role in bringing the industrial units, where mechanised ratts are used in to losses. And also non availability of enough working capital was reputed to the serious problems that affect the working and profitability of the coir co-operatives. The study suggested that financial assistance is necessary to be extended to the co-operative sector, for strengthening these types of organizations and thus to offer prospect to the poor.

Bjurek and Durevall (2000) analyzed the "Increase in total factor productivity for Zimbabwe's manufacturing sub-sectors against the structural adjustment program implemented from 1991 to1995". Malmquist productivity Index was used to evaluate productivity for thirty one manufacturing sub-sectors for the period 1980 to 1995. Further econometric methods were used to test the effect of trade reforms and market liberalization to the structural adjustment program. In general the results suggested a great variation in growth rates across sectors and over time period. There was no growth in the total factor productivity during structural adjustment program except for the last two years where most of the sub-sectors showed a growth in total factor productivity. The results of econometric analysis showed only import growth as influencing variable and all other variables measuring trade liberalization had no influence on productivity growth.

Tarlok Singh (2000) analyzed "Total factor productivity in the manufacturing industries in India". The study used annual data from 1973-74 to 1993-94 for a sample set of ten industries in the manufacturing sector. The results showed that the TFP recorded improvements in all sample industries except for the basic metal industries in which the TFP witnessed a declining trend during the period. The highest growth in TFP was observed in the case of food products followed by transport equipment, metallic products, electrical machinery, non-electrical machinery, wool and silk textiles, chemical and jute textiles.

Susan Linz (2000) estimated "Industry-wise and regional differences in labour productivity in Russian industry" at the beginning of the transition from a planned to a market economy for the year 1992. It was found that firms with below industry – average, labour productivity was expected to experience a higher than average reduction in work force

size. Spinning, machine –building, forestry, wood, and paper and construction materials industries ranked lowest in terms of labour productivity. Labour productivity in the Ural, Western Siberia and Black Earth Regions was significantly below that of firms in the Volga region

Soumyendra Kishore Datta (2001-02) analyzed "Partial productivity as well as wage productivity nexus in the mill sector for the period from 1966-67 to 1990-91". It was found that capital intensity changes had a greater impact on changes in labour productivity ratio where as the rise in per capita emoluments, reflecting increased well being of the employees, although had a positive influence on changes in labour productivity could not make a significant impact with regard to the movement of capital productivity. There was a more or less increasing trend till 1979-80, but gradually declined till 1988-89 with a slight recovery in the remaining two years of the last two decades. Labour productivity in cotton mill industry had out stripped the rise in capital productivity and contributed to the growth of output and total factor efficiency achieved. Factor productivity increases were largely due to increment in labour productivity.

Fare Grosskopf and Margaritis (2001) analyzed the "Relative trend in the total factor productivity in Australia and New Zealand for the manufacturing sector during 1986-1996". Their objective was to see whether reforms in the two countries have impact on the productivity performance because both countries had a major structural change with different pace and intensity. Malmquist Productivity Index was used to calculate the total factor productivity. Further it was decomposed into technical efficiency and technical change which helped in the analysis to check the source of TFP in the relative performance for two countries. In general, the results suggested that New Zealand performed better than Australian in terms of total factor productivity for manufacturing sector. This lower TFP in Australia was due to low capital intensity in production process. Further the major source of TFP growth in New Zealand was technical change rather than efficiency change.

Biswanth Goldar (2001) analyzed "Econometrically the relationship between technology acquisition and productivity growth in 82 large chemical firms in India for the years 1985-1986 to 1989-90".The results of the study showed that research and development efforts of the firm had a significant favorable effect on productivity growth. On the other hand the results indicated that technology imports did not make a significant growth. Export

intensity, firm size and intermediate goods, import intensity were positively related with productivity growth.

Hay (2002) analyzed the "Degree of change in productivity through changes in the level of production across different sectors". The period chosen for the analysis covered between 1984 and 1991. It was found that labour productivity in the Brazilian manufacturing sector had grown at a rate of 7.35 per cent in the period 1991-95. This period of productivity growth included two different phases. In the first phase, up to 1992 there was a deep recession with output falling, but employment falling ever faster. In the second phase, after 1992 productivity and output grew, but former grew faster to employment at a lesser rate than in 1990-92. There was a marked fall in 1990, followed by rapid growth to 1994. The co-efficient suggested a cumulative growth in total productivity of 58 per cent from 1990- 94.

Rao et.al. (2003) study aimed at "Assessing The productivity of the industrial sector in Maharashtra. In 11 industries", the share of capital in the total output has showed a tendency to increase after the firms. The study used the following total factor productivity method for measuring efficiency namely direct method, the Dormer Index, the Kendrick Index, the Solow Index and Translog method. The study found that the transport equipment industry had experienced a negative total factor productivity growth during the period 1980-89.

Fu (2005) for panel of "Chinese manufacturing industry estimated total factor productivity". TFP growth was estimated for period 1990-1997 using Malmquist Productivity Index. This Index was decomposed into technical progress and efficiency change. The analysis of the results showed that there was no evidence of significant productivity gains at industry level as a result of exports in a transition economy. It was suggested that a developed domestic market and a neutral out-ward oriented policy is necessary for exports to generate positive effect on TFP.

Burki and Mahmood Hassan (2005) analyzed the "Implications of allocative efficiency on resource allocation and energy substitutability in Pakistan's economy". The study covered the period 1969-70 to 1990-91 and utilized pooled time series data from Pakistan's large scale manufacturing sector to estimate a generalized translog cost function. The results pointed out strong evidence of allocative inefficiency leading to over- or under-utilization of resources and higher cost of production.

Afzal (2006) estimated "Total factor productivity for the large scale manufacturing sector from1975 to 2001 using three different approaches". In the first approach classical models were used and comparison of four models was made. Simultaneous equation approach was used at second step to measure the contribution of factors affecting productivity of large scale manufacturing. At third step auto-regressive models were used to forecast productivity. Overall results showed that productivity was affected by many factors like labor, capital, gross national product and per capita income.

Shallu Sehgal and Suparn Sharma (2011) using pooled data for the period of 1981-82 to 2007-08 for different categories of organized sector's manufacturing industries for the sample state of Haryana, analyzed the inter-temporal and inter-industry comparison of total factor productivity (TFP) measured by Malmquist productivity index (MPI), which is an application of DEA to panel data to calculate the indices of TFP change, technology change, efficiency change. The general development pattern observed by the Haryana was definitely not a healthy sign of structural change in the economy. The analysis of the discussion reflected that while the tertiary sectors have maintained its lion's share in GDP of India and Haryana as well, the declining trend in the share of primary sector and more or less stable contribution of the secondary sector was noticeable. The study revealed that technical efficiency change was the key driver of TFPG in the manufacturing sector of Haryana during pre -reform period, however, the picture has turned around during the post reform period. A positive impact of liberalization policy on technological advancement of the manufacturing sector of the state has been experienced. But, during the post-reform period the state has realized inefficiency in the utilization of resources in hand and it is really an alarming sign indicating that the incapability of manufacturing sector of the state in question to cope up with the technological advancement.

Sangho Kim and Muthusamy Saravanakumar (2012), in their study on "Economic Reform and Total Factor Productivity Growth in Indian Manufacturing Industries," by applying In this study stochastic frontier production function model to decompose the sources of total factor productivity growth into technical progress, technical efficiency, scale efficiency, and allocative efficiency. Empirical results based on data from 2000 to 2006 suggested that increased investment needs time to deliver increased productivity and efficiency, because new technology combined with fresh investment requires higher numbers of skilled workers, better managerial practices and an advanced input mix, all of which

generally take time to develop. Thus, the Indian economy must boost technical efficiency by providing skilled workers and high quality managers to further economic reform.

Arpad Abraham and Kirk White (2006) using a unique data base that covers the entire U.S. manufacturing sector from 1976 until 1999, estimated plant-level total factor productivity for a large number of plants.Time series properties of plant-level idiosyncratic shocks to productivity, was characterized taking into account aggregate manufacturing-sector shocks and industry-level shocks. Plant-level heterogeneity and shocks were a key determinant of the cross-sectional variations in output. The persistence and volatility of the idiosyncratic plant-level shocks to those of aggregate productivity shocks estimated from aggregate data was compared. It was found that persistence of plant level shocks was surprisingly low. Finally, it was found that estimates of the persistence of productivity shocks from aggregate data have a large upward bias. Estimates of the persistence of productivity shocks in the same data aggregated to the industry level produce autocorrelation estimates ranged from 0.80 to 0.91 on an annual basis. The results were robust to the inclusion of various measures of lumpiness in investment and job flows, different weighting methods, and different measures of the plants' capital stocks.

Ganna Vakhitova and Tetyana Pavlenko (2010) paid major attention to the "Impact of the government support on ukranian firm's research and development expenditures, innovations and productivity". The results showed that government financial support had positive effect on the probability and amount of firm's innovation expenditures but not on the probability of innovation itself, neither for process nor for product innovation. The latter finding emphasized that only the effective government innovation policy positively contributed to the productivity after all. It was found that firms which have introduced new or significantly improved product in the past were more likely to invest into R&D and to come up with a product innovator in the future. The results also suggested that amount of innovation expenditures in the following period was influenced by firm's productivity in the previous period. Finally, similar to Estonia during late transition only process innovation has been found to contribute to productivity of Ukrainian firms.

Crespi et.al (2010) examined the "Determinants of technological innovation and its impact on firm labor productivity across six Latin American countries (Argentina, Chile, Colombia, Costa Rica, Panama, and Uruguay) using micro data from innovation surveys". In line with the literature, in all countries firms that invest in knowledge were more able to

introduce new technological advances and those that innovate had greater labor productivity than those that do not. Yet firm-level determinants of innovation investment were much more heterogeneous than in OECD countries. Co-operation, foreign ownership, and exporting increase the propensity to invest in innovation activities and encourage innovation investment in only half of the countries studied. Scientific and market sources of information had little or no impact on firm's innovation efforts, which illustrated the weak linkages that characterize national innovation systems in those countries. The results in terms of productivity, however, highlighted the importance of innovation in enabling firms to improve economic performance and catch up

Arza et.al (2010) adopted the approach to estimate the relationship between "Innovation and productivity and the realities of innovative activities in developing countries". Panel data for Argentina during the period 1998-2004 was used to estimate a structural model in which different types of firms` innovative behavior—including in-house activities and the incorporation of external technologies fed into the probability of achieving successful results in product and process innovation, which in turn explained labor productivity. The endogeneity of this three-stage process was controlled for. The results suggested that all types of innovative activities were relevant to explain success in product and process innovation, and both were important factors to explain labor productivity. Moreover, investing systematically in R and D implies an extra payoff in labor productivity. These results suggested that investing in different types of innovative activities—and not only in R and D—and doing in-house activities systematically contributed to firms` innovative and economic performance.

Manjit Sharma (2010) under took a study on "Growth and Productivity Trends in Organised Manufacturing Sector of Punjab: A Study of Selected Industries," for the period of 1980-2003 for selected industries of organised manufacturing sector of Punjab. It was found that Organised manufacturing sector experienced negative growth rate in employment in post reform period i.e. era of 'jobless growth'. The economic reforms have no doubt ushered in an economic boom but this has not created enough jobs. Capital picked up slowly in the post reform period and is yet to be fully reflected in output and value addition. Growth rate of total factor productivity was higher in pre-reform period as compared to post-reform period for all the selected industries except basic metal and alloy industry. Food industry that has the potential to develop could not grow to their capacity owing to the laxity of the state government. Textile industry that enjoyed the captive market from the erstwhile Union Soviet

Sangh of Russia couldn't pick up in the productivity growth in the post reform period. Transport equipment and parts industry, which has considerable share in employment, now puts a question mark on further production capacity.

Arbelaez et.al (2011) in their study "Attempted to establish a formal relationship between innovation and productivity using Colombian firm-level data". It was found that the production of goods and services new to the firm and to the domestic market enhances firms` sales per worker, and innovation that results in introducing new goods and services to the international market boosts both sales and Total Factor Productivity (TFP). Innovation in processes likewise improves firms` productivity and sales. Finally, innovation in marketing and management increases sales per worker and enhances TFP when investment was made in Research and Development.

Nataraj and Shanthi (2011) using a unique data set of Firm-Level surveys that are representative of the entire Indian manufacturing industry, showed that India's unilateral reduction in final goods tariffs increased the average productivity of small, informal firms, which accounted for 80% of Indian manufacturing employment but have been excluded from previous studies. In contrast, the increase in productivity among larger, formal firms was driven primarily by the concurrent reduction in input tariffs. By examining the effect of the tariff liberalization on the distributions of productivity and firm size, evidences were found consistent with the exit of the smallest, least productive firms from the informal sector. In addition, although the decline in final goods tariffs did not significantly impact average formal sector productivity, it did increase productivity among the top quantiles of the distribution.

Jacques Yanyun and Zhao Zhen (2012) investigated relationships between "Innovation, input, output and labor productivity in China for four major manufacturing sectors; textiles, wearing apparel, transport equipment and electronic equipment". It used a large sample of firm level micro data and a structural model in the estimation. The data from 2005 to 2006 was estimated, and results of all the sectors showed positive effects from innovation input to output, and then to firm performance. Globalization has various impacts on innovation, through exports. It had a positive effect on both the decision to carry out R&D, and intensity of R&D input in sectors with competitive advantage, such as textiles and transport equipment, but not in sectors with high levels of overseas capital control, such aselectronic equipment and wearing apparel. Owner ship revealed the same story in different

sectors, namely that, foreign firms tend to does less in innovation input and output, but they do have higher level of productivity. Moreover, market share, subsidy, firm size and other characters of firms were involved in the estimation, which explained significant difference in engaging in innovation and production. Thus, in all the sectors, market share improved R and D input, continuous R and D input and exports improved new products output. Subsidy sustainsed R and D input, but not innovation output.

Eva Yamila Catela et.al (2012) discussed the "Evolution of firms' productivity and structural heterogeneity (SH) in the Brazilian manufacturing industry in the 2000s". SH was defined (following the Latin American structuralist tradition) as a situation in which a large share of total firms is in the lowest productivity groups of the production structure, and there are very large differences in labour productivity between groups and firms. The paper combined and made compatible several data bases on manufacturing production, innovation and micro-social data for Brazil, in order to measure productivity and SH, to analyze its evolution between 2000 and 2008, and to discuss its determinants. Econometric analyses (k-means cluster methodology to identify productivity groups, and ordered probit models to analyse the determinants of SH) showed that increasing returns in innovation and learning prevailed in the 2000s, while policies failed to encourage the catching up process by laggard firms. As a result, SH did not fall in the Brazilian manufacturing sector.

Saba Vahid (2012) focused on the "Productivity changes of the manufacturing industries in the U.S. from 1997 to 2002". The results showed 5 percent increase in productivity of the whole sector on an average over the study period, while the productivity of the wood product manufacturing decreased by 1 percent over the same period. The efficiency decline of the industry was the main contributor to the decline of its productivity. The recent decline in investments on capital and training and education of work force in wood manufacturing industry could be among the factors affected its productivity and if this trend continues, it would affect the productivity and consequently the competitive position of the industry more negatively.

Fulwinder Pal Singh (2012) analyzed the "TFP growth trends in Indian manufacturing sector at both aggregated and disaggregated inter-state levels". Using the Malmquist productivity index for panel data set of 16 major industrial state over a period of 29 years spanning over 1979-80 to 2007-08, the study observed manufacturing sector of India was growing with 9.1 percent per annum growth of Total Factor Productivity (TFP) during

the entire study period. Out of sixteen industrial states there were five states namely Uttar Pradesh, Madhya Pradesh, Gujarat, Orissa and Rajasthan where double digit TFP growth has been noticed. The manufacturing sector of Uttar Pradesh was growing with highest TFP growth at the rate of 12.8 percent per annum followed by Madhya Pradesh with TFP growth of 11.8 percent per annum. The analysis of the sources of the TFP growth in Indian manufacturing sector revealed that both technical progress and technical change were equally contributing TFP growth in sector under evaluation. It has also been observed that at all India level efficiency change was greater than technical progress.

Jajri et.al (2013) attempted to analyse "Trend of, technical efficiency, technological change and TFP growth in the Malaysian manufacturing sector". The analysis was based on data from the Industrial Manufacturing Survey of 1985 to 2000 collected by the Department of Statistics, Malaysia using Data Envelopment Analysis (DEA). The results showed that during the period under study, TFP growth was increasing and it was the major contributor of TFP growth in technical efficiency. Nevertheless, technological change show increasing trend over time. The industries that experienced high technical efficiency were food, wood, chemical and iron products. However, for food and wood industries technical efficiency was higher than technical progress. The other industry that showed larger technical progress than technical efficiency was textile industry but both values were below unity.

Chidambaran Iyer (2013) in his study on "Urbanization in India and Productivity of Manufacturing Industries: An Empirical Study," attempted to empirically analyse the impact of urbanization on the productivity of manufacturing industries in India. The results from a panel of 15 industries across 13 states during the period 1981-2008 suggested that, there was variation in the effect of urbanization both within and across industries. The variation within an industry was observed across different time periods. As mentioned in literature, technology intensive and innovative industries seem to have benefitted more from the pattern of urbanization in the country.

Arnab Deb and Subhash Ray (2014), under took a study on" Total Factor Productivity Growth in Indian Manufacturing: A Biennial Malmquist Analysis of Inter-State Data," In this study Using input-output data from the Annual Survey of Industries for the period 1970-71 through 2007-08, They compared the pre- and post-reform performances of Indian manufacturing in terms of total factor productivity growth. Data Envelopment was used Analysis to construct a Biennial Malmquist Index of total factor productivity for

individual states. Results showed that at the all-India level, total factor productivity growth rate in manufacturing was higher during the post-reform period. Although the majority of states experienced accelerated productivity growth, some states did experience decline in productivity after the reforms. Both before and after the reforms technological progress was the most important component of productivity growth in Indian manufacturing.

Kirtti Ranjan Paltasinghand and Mishra (2015) made an attempt to test "Economic Reforms and Industrial Productivity: Testing the J-Curve Hypothesis" at State level. The study confirmed that in case of little industrially developed states at the time of initiation of reforms like Maharashtra and Tamil Nadu, productivity growth behaved in S-curve pattern in the sense that productivity increases in subsequent periods. But in case of Gujarat it was like J-curve pattern in the sense that the growth of productivity declined initially then increased in subsequent period. Thus, the study concluded that the impact of liberalization has not been similar on state manufacturing sectors. Some states immediately responded to reform and some with a lag but ultimately liberalization achieved the goal of getting the industrial sector competitive and efficient one.

Manonmani and Geetha (2011) in their study analyzed "Wage-productivity relationship in the manufacture of Wood and Wood products". The reference period of the study was from 1979-80 to 2008-09. In order to clearly understand the links between wages and productivity in selected industries, this study had used a simple econometric analysis namely, step-wise regression model. The wage-productivity relationship that existed in the manufacture of Wood and Wood products in majority of the cases (either insignificant or negative) disproved the hypothesis that wage rate (Lnw) was significantly related to labour productivity (LnGVA/L). This explained the fact that there were factors other than those considered in this model that have influenced the real wage rate (Lnw) in this industry.

Manonmani and Geetha (2013) in their study attempted to analyse "Productivity linked wage in the manufacture of paper and paper in Tamil Nadu The reference period of the study was from 1979-80 to 2007-08". In order to clearly understand the links between wages and productivity in selected industry, this study had used a simple econometric analysis namely, step-wise regression model. The findings supported the positive relationship between the real wage rate and labour productivity. A negative and insignificant relationship between consumer price index for industrial workers and change in real earnings was observed in all the models. Positive relationship between changes in capital intensity and changes in wage

rate was witnessed. The trend variable explained the fact that there were other institutional factors that influenced wage rate other than labour productivity. This was explained with the help of significant relationship between time trend and wage rate in most of the cases. The analysis of the relationship between wage rate and total factor productivity index revealed equal chances of showing significant as well as insignificant relationship that existed between the two.

Manonmani and Geetha (2013) attempted to analyse the "Wage led productivity" at the regional level by concentrating on one particular state namely, Tamil Nadu. The reference period of the study was from 1979-80 to 2007-08. In order to clearly understand the links between wages and productivity in selected industry, this study had used a simple econometric analysis namely, step-wise regression model. The outcomes of regression analysis of functions exploring relationship between wages and productivity in the manufacture of Food Products, Beverages showed a strong association of wage rate (Lnw) and labour productivity (LnGVA/L).

Manonmani (2014) analysed the "Impact of Economic Reforms on Productivity Performance of Manufacturing Sector in South India" during 1991-92 – 2011-12. The annual trend rates revealed that labor productivity growth rate was maximum in the state of Tamil Nadu (9.15percent). The indices of capital productivity had shown increasing trend in case of Andhra Pradesh, Kerala and Tamil Nadu except Karnataka. The total factor productivity was found to be increasing from the beginning of the post- liberalization period in all the southern states.

Manonmani (2014) in her study on "Total Factor Productivity of Indian Corporate Manufacturing Sector" examined by applying the non-parametric index number approach of measuring total factor productivity during 1999-00- 2010-11 for the Indian corporate manufacturing sector. The approach includes Kendrick index, Solow index and Translog index. It was found that in the private limited companies all the indices of total factor productivity except, Kendrick method had shown increasing trend. In public corporations except Translog all the other total factor productivity indices had shown negative trend rates. In government departmental enterprises the total factor productivity indices of all the methods showed a declining trend. The total factor productivity indices of aggregate corporate sector revealed that excepting Kendrick index, all the other total factor productivity indices had increased.

Sanjoy Saha (2014) in his study on "Total Factor Productivity Trends in India: A Conventional Approach" attempted to estimate the aggregate Total Factor Productivity (TFP) for the Indian economy using the conventional growth accounting method. It has been observed that on an average the TFP has grown by 1.49 per cent during the study period but it was erratic in nature. Although during 1960s the average TFP growth in India was positive, it was very low and almost close to zero. Similarly, the economy experienced technological regress instead of technical progress during 1970s due to the average negative TFP growth. External shocks like war, drought, oil price-hike along with rigid rules and regulations during these periods could be the probable reasons for low productivity of the economy. However, the economy's overall productivity has increased considerably after the initiation of internal economic reforms measures during 1980s. The economy has been experiencing continuous rise in TFP growth since the introduction of external economic reforms. The study revealed that TFP estimates in India were not sensitive to factor shares.

3. Production function estimates of manufacturing industries

Manonmani and Ansari Begum (2014) found that the magnitude variability in the growth of Marginal productivity of labour(MPL) ratios were more across the reference period when compared with the trend across the low technology industries in India from 2001-02 to 2010-11". Capital has contributed positively to output. Significant growth rate was found in labour productivity in all the industries. Majority of these industries had shown insignificant growth of total factor productivity. Fixed capital used to be substitute for labour to a larger extent across the industries during the reference period under study. The contribution of entrepreneurship to output was positive.

Manonmani and Suganya (2014) from 2001-02 to 2010-11, the marginal productivity of labour (MPL) ratios across major high technology industries in India showed instability in its growth. The variations in Marginal productivity of capital (MPK) ratios might be due to wage differentials across the high technology industries. Differences in the marginal productivity ratios of labour and capital brought about differences in marginal rate of technical substitution. More than ninety percent of the variation in the growth of labour productivity was due to the influence of institutional factors. The varying levels of magnitude of total factor productivity trends explained the fact that across the industries the significant growth rate might be due to the provision of better infrastructural facilities available to these industries. The contribution of entrepreneurship to output was positive

Manonmani (2013) analysed the technical progress of the corporate sectors by calculating marginal productivity labour (MPL), marginal productivity of capital (MPK), marginal rate of technical substitution between labour and capital ($MPTS_{LK}$) and capital intensity(K/L)". The study covered the period from1999-00 to 2010-11. MPL ratios of various sectors during the period showed that among the sectors on an average public limited company had recorded the maximum ratio. Public corporation has recorded the maximum average MPK ratios of 5.3239 across the years. Capital labor ratios (capital intensity) across the intra sectoral group analysis was maximum (4.4054) for private limited company. The mean $MRTS_{LK}$ was maximum in public corporation. Wage coefficient (β) was positive in all sectors and statistically significant. This implied that wage contributed significantly to output.

Manonmani (2013) examined the trends in "Factor Productivity and Productivity Gains in the Aggregate Manufacturing Sector of India in the Pre- and Post-Liberalization Period". The reference period chosen for the study covered both pre and post liberalization period. The pre-liberalization period covered between 1972-73 and 1990-91 and post-liberalization period between 1991-92 and 2009-10. Many differences were not observed in average growth of the labour productivity in the pre and post reform period. There were no improvements in the growth of capital productivity and the linear growth rate was negative in both the periods. Much variation was observed in the mean growth of total factor productivity in both the periods. Capital enjoyed substantial share in productivity gains. The share of labour in net distributable output has been less than the share of capital in both the periods.

Manonmani (2013) estimated production function in the aggregate manufacturing sector of southern states for the reference period between 1991- 92 and 2010-11". The results assessed the importance of skilled labour component in the states such as Karnataka, Andhra Pradesh and Kerala. With regard to the type of technology adopted by the states, it could be observed that the manufacturing sector of Andhra Pradesh, Karnataka and Kerala were adopting labour intensive technology since the co-efficient of wage (β2) was greater than capital co-efficient (β1). The manufacturing sector of Tamil Nadu was known for capital intensive technology based on the co-efficient (β1>β2).

Manonmani (2011) assessed the efficiency of transport equipment industry for the reference period of the study is between 1998–99 and 2007–08". By applying a stochastic frontier production function as proposed by Battese and collie it was found that the

performance of the transport equipment industry has reached maximum efficiency level throughout the reference period. It was concluded that stable macro-economic framework, sound regulatory structure, investor friendly policies, and sustainable project revenues, transparency and consistency of policies, effective regulation and liberalization of labour laws and good corporate governance are the basic requirements, would define the success of the transport sector in future also.

Rakesh Kumar (2006) under took study on "Liberalization, Efficiency, Productivity and Production Function Behaviour in Indian Manufacturing Sector". This study has been carried out for the period of 1980-2000, a decade before the new policy reforms introduced and a decade after. To verify the hypothesis of considerable improvement in efficiency, productivity, and change in production function behaviour, various statistical and econometric techniques have been used. Manufacturing sector, during the liberalized period had experienced deceleration in its total factor productivity growth, but explanation for this deceleration does lie in liberalization measuring variables rather somewhere else. Even, manufacturing sector did not experience much change in efficiency. For the manufacturing sector as a whole, translog production technology has been rejected. Cobb-Douglas production function has been accepted. Except for neutral technology assumption, by applying likelihood ratio test. Production function behaviour did not witness much change even after introduction of binary variable for post-reform period.

Mahmood et.al (2007) examined the "Efficiency of the large scale manufacturing sector of Pakistan" by using the stochastic production frontier approach. This frontier was estimated for two periods 1995-96 and 2000-01, for 101 industries at the 5-digit PSIC. The results of this study showed that there was some improvement in the efficiency of the large scale manufacturing sector, although the magnitude was small. The results were mixed at the disaggregated level, whereas a majority of industries had gained in terms of technical efficiency and some industries were also weaker in terms of their efficiency level.

Manjappa and Mahesha (2008) analyzed "Productivity performance of selected capital –intensive and labour – intensive industries in India" during reform period. The total factor productivity growth was estimated by applying ratio form of Cobb-Douglas (C-D) production function on the panel data of 10 manufacturing industries by classifying them in to capital-intensive and labour –intensive industries for the period 1994 to 2004.The investigation revealed that four out of five industries in capital – intensive segment showed

productivity growth during the sample period, while one has recorded no change. A somewhat contrasting picture was observed for labour- intensive sector, where productivity decline was statistically significant in three industries.

Upender and Mulakala Upender (2009) analysed the magnitude of the elasticity of substitution between labour and capital across twenty six major industries [Factory Sector] in India". has been estimated in the present paper by fitting a Constant Elasticity of Substitution Production Function for the year 2004-05.The empirical results emerged out of the cross section data demonstrated that the estimate of the elasticity of substitution between labour and capital across the major Indian Industries was significantly more than unity implying that substitution possibilities were rather more in favour of labour in the Indian major Industries.

Santosh Kumar Sahu Krishnan Narayanan (2011) estimated the transcendental logarithmic production function and analysed the relationship between energy intensity and total factor productivity (TFP). The estimation of TFP was based on four inputs model; labour, capital, material and energy. The findings suggested that labour and material inputs played major role as compared to the capital and energy input. Further, estimates suggested that age of the firm, export intensity and disembodied technology import were positively related to the TFP, where as ownership, energy intensity, embodied technology import and R&D intensity were negatively related to TFP of the Indian manufacturing industries. In addition, energy efficient firms also found to have high levels of TFP. This implied the need for fostering energy efficiency at firm level in Indian Manufacturing.

Danish (2011) in his study on "J-Curve Hypothesis of Productivity and Output Growth: A Case Study of Indian Manufacturing in the Post Reforms Period," attempted to provide a theoretical explanation for the dip in productivity and output growth in early phases of reforms and estimated if the reforms displayed a positive impact in later period. The underlying reasons for J-curve hypothesis were provided mainly in terms of technological gap (compared to the global benchmark) and relatively weak mobility of factors of production (like labour, capital, industrial/urban land etc) including those that arise from the rigidity in labour laws and difficulty associated with acquisition of land for industrial development. The study analysed both aggregate and two-digit ASI industries over a period 1992/93-2007/08 and observes the trends in the following three sub-periods: (i) 1992/93-1997/98, (ii) 1998/99 to 2001/02, and (iii) 2002/ 03-2007/08. Empirical results obtained in the study, in general, supported the hypothesis of J-curve pattern of productivity and output

growth in the Indian organized manufacturing sector. The J-curve effect wasfound to berelatively weak in globally competitive sectors (like textiles) and strong in the sectors with relatively large technological deficit (like Automobiles). In view of continuing technological gap in many sectors and weak mobility in factors of production, it was concluded that productivity and output growth could respond to earlier economic reforms even better, if these issues were addressed adequately.

Sri Poorni and Manonmani (2014) evaluated the major factors influencing total factor productivity in the aggregate manufacturing sector of southern states of India-Tamil Nadu, Kerala Karnataka and Andhra Pradesh. The study covered the reference period between 2000-01 and 2011-12. This study was based on ASI data. The major objective of the study was to find out major determinants of total factor productivity across the southern states of India by applying discriminant function. It was found that labour productivity (LP), gross output (GVA) and capital intensity (K/L) were significant at 5 percent level in influencing total factor productivity across the states. The variable capital productivity (CP) alone was insignificant. Labour productivity, capital productivity had positive signs indicating that these variables had higher discriminating power in the period selected. The variable gross output and capital intensity K/L having negative sign implied that these variables acted as a suppressor variables. Capital productivity was the first dominant factor to determine total factor productivity and it alone contributed 79.72 percent and labour productivity contributed negatively.

4. Industrial concentration of manufacturing industries

Ana M. Fernandes and Gunjan Sharma (2012) investigated the "Determinants of spatial concentration and entry within manufacturing across states in India". Using an unbalanced panel of 180 industries spread across 16 major Indian states over the time period 1985-2007, they estimated the effect of location (state) characteristics interacted with characteristics that make industries naturally more prone to concentrate in locations (states) of certain types on spatial concentration and entry. The results showed that governance, infrastructure and the availability of skilled labor were important determinants of increased concentration and entry. Moreover, the estimates indicated that state characteristics associated with lower distance to foreign markets, lower costs of accessing domestic suppliers, or lower costs of doing business matter for the impact of licensing, FDI and trade reforms on concentration and new entry. There was also evidence that less substitutable

inputs (e.g., roads) raise spatial concentration while more substitutable inputs (e.g., electricity) did not.

Athreye et.al (2010) studied industrial concentration in Indian manufacturing sectors over the period 1970 to 1999. Given that Indian industry was highly regulated till the mid-1980s, the market structure in most manufacturing sectors was largely shaped by government policy. Deregulation after 1985 allowed greater scope for competitive processes, so that concentration levels are now more likely to be determined by industry characteristics rather than government policy. It was found that, on the whole, concentration levels were indeed more significantly related to industry characteristics after deregulation. However, even after controlling for these characteristics, there was considerable heterogeneity in the patterns of concentration in individual industries.

Shireen Aiazzawi (2013) found that gender wage gap increased significantly in Egypt over the last two decades, while female labor force participation rates have steadily declined". This study investigated the relationship between women's labor market outcomes in the manufacturing sector, the degree of industry concentration, and the trade reforms that took place simultaneously. Results indicated that industry concentration is detrimental to women in the labor market and that the impact of trade liberalization differs depending on the degree of concentration and the nature of the international competition. In initially competitive industries, increased import competition was associated with higher gender wage gaps and lower female employment. Increased export intensity on the other hand was associated with a lower gender wage gap, but lower female employment. Conversely, opening up to increased international import competition in initially concentrated industries was associated with falling gender wage gaps and rising female employment, while increased exports in these industries was associated with higher female employment as well. These findings have important implications for policy makers attempting to create more equitable labor market conditions in post-revolutionary Egypt.

Ronald (2013) reviewed the empirical evidence on industrial concentration and its economic correlates (notably firms' performance as measured by profitability, factor productivity and innovation. It also analyzed how the introduction of competition policies and laws in South Korea, China, India, Indonesia and the Philippines affected industrial concentration. It will examine at what point in their industrialization and economic development these economies implemented these laws and policies. The empirical literature

suggested that industrial concentration could exhibit an inverted-U-shaped relationship as far as its link to certain economic indicators of success, such as productivity and innovation. This suggested a role for recalibrating policies to adjust the balance between industrial concentration and competition, so that the over-all outcomes are net welfare enhancing. Indeed, country policy experiences reviewed here appear to demonstrate this recalibration, notably following privatization and liberalization.

5. Efficiency of manufacturing industries

Manonmani and Ramya (2011) in their study on "Efficiency of India's Intermediate Goods Industries in the Liberalized Regime" analysed the technical scale, cost and allocative efficiencies of select Indian intermediary goods industries such as manufacture of chemical and chemical products, paper and paper products, leather and leather products and non-metallic mineral products in the liberalized regime between 1991-92 and 2005-06. The efficiency scores were obtained by applying Data Envelopment Approach (DEA). It was found that for the entire period, technical, scale, cost and allocative efficient Decision Making Units were more under variable returns to scale (VRS) than under constant returns to scale (CRS) production technology

Manonmani (2013) examined "Efficiency of textile industry of India". The basic data source of the study was Annual Survey of Industries (ASI) published by Central Statistical Organisation (CSO), Government of India covering the period from1991-92 to 2009 -10". All the referred variables were normalized by applying Gross Domestic Product (GDP) deflator. The maximum likelihood estimates for productive efficiency show that in single output case, parameters of capital input was positive and statistically significant. Hence capital is main input factor for these industries as its value was higher than labour. The co-efficients of $\sigma 2$ and γ were statistically significant though the sign of them differs. It reveals that estimated levels of output considerably differ from their potential levels due to factors, which are within the control of the industries. The estimated value of γ indicated the absence of efficiency gap that exists between the actual and potential level of performance which is mainly due to technical efficiency .

Manonmani (2014) made an effort to measure the technical, scale, cost and allocative efficiency in the manufacture of furniture products in India. by applying a computer program known as Data Envelopment Analysis Program DEAP-version 2.1 for the reference period between 2001-02 and 2011-12.It was found that both under Constant Returns to Scale (CRS

and Variable returns to Scale (VRS)Production technology, the number of technical efficiency scores or levels which reflects the ability of a firm to obtain maximal output from a given set of inputs during the entire period, was indicative of the fact that the efficiency in the manufacture of furniture products was not strongly influenced by the size of production. DEA results applied to know the scale efficiency for the entire period revealed that it was not operating at an optimum scale. Indeed most of the inefficient Decision Making Units (DMU) presented increasing returns to scale characteristics which indicated that the industry can increase the scale to effectively improve that efficiency. Considering the cost efficient DMU's, it was found to be more under VRS production technology. The average cost inefficiency was more under CRS production technology than under VRS production technology.

Manonmani (2014) in her research on "Different Forms of Efficiency in the Manufacture of Furniture Products in India - An Application of DEA" for the reference period between 2001-02 and 2011-12 found that Under Constant Returns to Scale (CRS) production technology, technical efficiency between 2001-02 and 2011-12 was 0.919. This implied that the industry would have needed only 91.9% of the inputs currently being used. In terms of average inefficiency it would have needed 22.5% more inputs to produce the same output. Under VRS production technology, the number of efficient DMUs exceeded the number of efficiency DMUs under CRS production technology. Always under VRS production technology, higher average efficiency was recorded. The average scale efficiency was 94.4%. In terms of average inefficiency, it could increase additional production to the extent of 5.6%, by taking advantage of their scale characteristics. Under Constant Returns to Scale (CRS) technology, the industry was cost efficient to the extent of 84.5%. Under Variable Returns to Scale (VRS) production technology the industry was more efficient to the extent of 89.2%. Estimates revealed that over the study period, the industries under CRS production technology had on an average allocative efficiency level of 92.2% implying that the industries were 7.8% inefficient respectively.

Sri Poorni and Manonmani (2014) in their paper made an effort to measure the technical, scale, cost and allocative efficiency in the urban manufacturing sector of India by applying DEAP version 2.1 for the reference period between 2001-02 and 2011-12".It was found that both under CRS and VRS technology, the number of technical efficiency scores or levels during the entire period, was indicative of the fact that the efficiency in the manufacture rubber and plastic products was not strongly influenced by the size of

production. DEA results applied to know the scale efficiency for the entire period revealed that it was not operating at an optimum scale. Indeed most of the inefficient DMUs presented increasing returns to scale characteristics which indicated that the industry can increase the scale to effectively improve that efficiency. Considering the cost efficient DMU's, it was found to be more under VRS production technology. The average cost inefficiency was more under CRS production technology than under VRS production technology

Sri Poorni and Manonmani (2014) in their study analysed the productive efficiency of rural, urban and aggregate industries of India from1998-99 to 2010-11. A stochastic frontier production function as proposed by Battese and coelli (1992) was applied to analyse the data based on the objectives. It was found that both urban and rural Industries were enjoying increasing returns to scale. This had no doubt made the aggregate industries also work under increasing returns to scale. The technical efficiency of rural industries have not shown any decline but showed mixed trend. The inefficiency present in aggregate industries was negligible. But as indicated earlier about their inefficiency in future, these industries can become more efficient by increasing output, using the existing resources or by reducing costs given the current level of production. Labour was the main factor without much variation in its contribution to the growth of net value added in urban industries. Whereas capital was the main input factor for aggregate industries. The main factors of production were both capital and labour in rural industries.

Manonmani (2015) in her study made an effort to measure the technical, scale, cost and allocative efficiency in the manufacture of fabricated metal products in India by applying DEAP version 2.1. For the reference period between 2001-02 and 2011-12.It was found that both under CRS and VRS technology, the number of technical efficiency scores or levels during the entire period, was indicative of the fact that the efficiency in the manufacture of fabricated metal products was not strongly influenced by the size of production. DEA results applied to know the scale efficiency for the entire period revealed that it was not operating at an optimum scale. Indeed most of the inefficient DMUs presented increasing returns to scale characteristics which indicated that the industry can increase the scale to effectively improve that efficiency. Considering the cost efficient DMU's, it was found to be more under VRS production technology. The average cost inefficiency was more under CRS production technology than under VRS production technology.

METHODOLOGY

III.METHODOLOGY

The methodology relating to the current study is discussed under the following heads:

1. Selection of the Topic
2. Selection of the Industries
3. Selection of the Variables
4. Data Base of the Study
5. Tools of Analysis
6. Limitations

1.Selection of the Topic

The economic development of a country depends mainly on industrial development. In manufacturing sector, the scope for internal as well as external economies is greater than in other sectors. It acts as an instrument both for creating capacity to absorb excess labour power and for diversifying the market required to boost economic development. Therefore, the present study is attempted to analyze the productivity, production function elasticity industrial concentration wages and earning, Factor intensity, Factor's share in total input and some theoretical laws and hypothesis in the manufacturing sector of India-disaggregating in to various high technology manufacturing sector.

2. Selection of the Industries

The importance of the co-operative sector in the industrial sphere as an instrument of socio- economic development cannot be over emphasized or exaggerated. The artisans and villagers engaged in Agro- based industries suffer from all those disadvantages of scale of production and competition. It is through industrial societies artisans could secure all those advantage which are otherwise derived to them. It may be mentioned that in order to mobilize the small savings of the local people for further utilization of local resources, large-scale industrial societies have developed. The promotion of co-operatives enterprise in all industrial activities has received acceptance as one of the appropriate means for solving many of the prevailing economic ills, in particular of the industrial sectors.

3. Selection of the Variables

Gross output was taken as output, since trends are not affected significantly by the use of gross output. Also ambiguity in the calculation of depreciation can be overcome if gross output is taken as a measure of output. Labour input consisted workers directly involved in production and employees other than workers. The fixed capital was

taken into account as capital input. Wages included remuneration paid to workers. Emoluments are considered as remuneration paid to the employees.

4. Data Base of the Study

The basic data source of the study was Annual Survey of Industries (ASI) published by Central Statistical Organization (CSO), Government of India covering the period from 2001-02 to 2013-14.All the referred variables were normalized by applying Gross Domestic Product (GDP) deflator. The GDP at current and constant prices were obtained by referring to Economic Survey, published by Government of India, Ministry of Finance and Economic Division, New Delhi.

5. Tools of Analysis

i. Productivity Indices

Labor productivity (PFPL) is measured as a ratio of to total gross output number of persons employed. Capital Productivity (PFPK) is measured as a ratio of gross output to gross fixed capital.

Total Factor Productivity (TFP), in a simple way, is defined as output per unit of inputs. It is the ratio of aggregate output index to aggregate input index and measures the efficiency of all inputs in a production process. In other words, TFP is the portion of output not explained by the amount of inputs used in production. This is known as a residual and is calculated by making use of the formula as follows.

$$TFPDM=\sqrt{PFPK \times PFPL}$$

Where TFPDM=Total Factor Productivity Index of Direct Method

PFPL=Partial Factor Productivity of labor

PFPK=Partial Factor Productivity of capital

ii.Linear regression models

i.Testing ability to pay hypothesis (Model-I)

The linear relationship between wages and labour productivity was examined through the following regression equation:

$Ln\ W=a + b\ Ln\ P_L$

Where

W = wage paid

P_L = Labour productivity

a = constant or intercept of the regression line

b = Elasticity of wage with respect to labour productivity

Ln = Natural log

ii. Testing Verdoorn's law (Model-II)

The Verdoorn's law has been estimated as a linear relationship between labour productivity growth and output growth by applying the following linear regression formula.

$Ln\ P_L = c + b\ Ln\ OUT$

P_L = Labour productivity

OUT = gross output

C = constant or intercept of the regression line

b = Elasticity of labour productivity with respect to output

Ln = Natural log.

iii. Testing impact of technology on wage (Model –III)

Testing impact of technology on wage in different sub-sectors of the industry was examined through the following regression equation

$$Ln\ W = a + b\ Ln\ K/L$$

Where

W = Average wage paid

K/ L= Capital –labour ratio (technology) or Capital Intensity

a= Constant or intercept of the regression line

b=Elasticity of wage with respect to capital intensity (K/L)

Ln= Natural log.

iv. Employment Elasticity:

Employment elasticity was estimated as follows, where employment is regressed on the gross output and fixed capital.

$$\text{In } L_t = \alpha_0 + \alpha_1 \ln Y_T + \alpha_2 \ln K_t$$

Where, Lt = Number of workers engaged in the current period

Y_t = Gross output in the current period

K_t = Fixed capital in the current period

α_0 = Constant co-efficient

α_1 = Elasticity of employment with respect to gross output

α_2 = Elasticity of employment with respect to fixed capital

$\alpha_2 > 0$ implies of employment and capital are complements

$\alpha_2 < 0$ implies of employment and capital are substitutes.

v. Output Elasticity

The elasticity of output with respect to employment of labour and fixed capital measures the change in output due to change in one unit of labour or change in one unit of capital. The output elasticities was estimated as follows:

Where, $\text{In } Y_T = \alpha_0 + \alpha_1 \ln L_t + \alpha_2 \ln K_t$

Lt = Number of workers engaged in the current period

Y_t = Net value added in the current period

K_t = Fixed capital in the current period

α_0 = Constant co-efficient

α_1 = Elasticity of employment with respect to labour

α_2 = Elasticity of employment with respect to capital

vi. Wage Elasticity

The wage elasticity with respect to labour productivity and output measures the change in wage rate due to change in one unit of the above mentioned variables. The elasticity can be estimated as follows:

$$W_t = \alpha_0 + \alpha_1 \ln L_p + \alpha_2 \ln y$$

W_t = Wage rate in the current period

Lp = Labour productivity in the current period

Y_T = gross output in the current period

α_0 = Constant co-efficient

α_1 = Elasticity of wage with respect to labour productivity

α_2 = Elasticity of wage with respect to gross output

Vii.Determinants of Productivity

Taking partial factor productivity of labour (LnPFPL), partial factor productivity of capital (LnPFPK) and total factor productivity indices of direct method (LnTFPDM) dependent variables multiple linear regression model was applied to analyse the major sources of productivity growth. The model is as follows.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4$$

β_0 = constant co-efficient

Where Y = Dependent variable (LnPFPL, LnPFPK, LnTFPDM,)

X1, X2, X3, X4 = Independent variables namely gross output (LnOUT),

Wage rate (Ln W), capital intensity (Ln FC/L) and time factor (Ln T)

$\beta_1, \beta_2, \beta_3, \beta_4$ = Regression co-efficient of X1, X2, X3, X4 respectively

3. Cobb-Douglas production function

One of the most commonly estimated functional forms in the Cobb-Douglas production (C-D) function written as:

$$V = A(t)\, K^{\alpha}\ L^{\beta}\ e^{u}$$

Where V is gross output α and β are coefficient of labour and capital, A (t) is the efficiency parameter and u is the stochastic disturbance term following usual properties. Before the production function can be estimated some functional form has to be given to the term a (t). The most commonly used in practice has been $A(t) = Ae^{\lambda t}$ where λ is the measure of technical change in output per period [λ measures the proportionate change in output per period when input level are held constant]. It is very important here to Point out the limitations of this representation of technical change. It assumes neutral technical progress and that the technical progress is exogenous and disembodied (this neglects the usefulness of investment for technical progress).

This function is linear in the logarithmic of the inputs, output and time. Thus, we have:

$$\text{Ln } V = a + \alpha \text{ LnL} + \beta \text{LnK} + \lambda t + \mu_i$$

The estimation of this equation yields values of α, β, and λ,λ provides estimates of TFPG and is the rate of exponential technological change. Sum of the partial elasticities ($\alpha + \beta$) indicates the extent of economies or diseconomies to scale. The returns to scale are constant, increasing or decreasing if the value of $\alpha + \beta$ is equal to unity, more than unity or less than unity respectively.

Marginal product of labour (MPL) and capital (MPK) can be obtained by applying the following formula

$$MP_L = \delta V/\delta L = \alpha V/L$$

$$MP_K = \delta V/\delta K = \beta V/K$$

Since profit maximization entails that marginal productivity of labour is equal to the real wage rate and marginal product of capital is the price per unit of capital, it would

imply that:

$$MP_L = w/p = \alpha V/L.$$

Share of labour in total output is:

$$\alpha = (w/p).\ (L/V).$$

Similarly

$$MP_L = r/p = (K/L).$$

$$MP_k = r/p = (k/v)$$

And share of capital in total output is

$$\beta = (r/p).\ (K/V)$$

$$MRS_{LK} = MP_L / MP_K$$

4. Ratios

i. Wage rate=Total wages / Number of workers

ii. Earning per employee=Total emoluments / Number of workers

iii. Labour intensity = (L/K) =Number of workers / Capital employed

iv. Capital intensity = (K/L) = Capital employed / Number of workers

v. Labour efficiency = (L/O) = Number of workers / Total output

vi. Capital efficiency= (K/O) = Capital employed / Total output

vii. Percentage share of labour in total input= L / I = Number of workers / Total input

ix. Percentage share of capital in total input = (K / I) = Capital emplyed / Total input

x .Geographical concentration =Total factories / Geographical area

xi.Market concentration=Total output/Number of factories

5. Compound Annual Growth Rate (CAGR)

In the present study, compound annual growth rate of total factor productivity, labour productivity and capital productivity was calculated. Symbolically it is represented as follows:

$$Y = ab^t$$

Where,

Y = is the dependent variable (i.e. total factor productivity, labor and capital productivity,

t = is the independent variable (i.e. time period) a&b are the parameters. After getting b (coefficient) the following method is being used to estimate CAGR

$$CAGR = [\text{Antilog } p - 1] \times 100$$

6. Co-efficient of variation

The coefficient of variation is defined as the ratio of the standard deviation to the mean:

$$C.V = \frac{\sigma}{\bar{X}} \times 100$$

C.V= coefficient of variation

σ = Standard devaition

$\bar{X}$=Mean

7. Annual Variation

The annual change in the growth of number of factories was calculated using the formula below:

AV= VT - Vt-1/Vt-1 Where

AV=Annual variation

VT= Current year value

Vt-1= Previous year value

8. Other tools

Base year indices, percentages, graphs, diagrams and ratios were calculated other tha the above mentioned tools.

9. Limitations

One of the limitations of the present study is that it is confined only the particular reference period .The findings emerging out of this study may not suit other reference periods and other manufacturing sectors.

RESULTS AND DISCUSSION

IV. RESULTS AND DISCUSSION

The result of the current study is discussed under the following heads:

1. Growth of number of factories
2. Geographical and market industrial concentration
3. Partial and total factor productivity indices
4. Wages and earnings
5. Factor intensity
6. Factor efficiency
7. Factor's share in total input
8. Production function estimates
9. Sources of productivity growth
10. Relative importance of technology on wage, output and labour productivity
11. Important theoretical law/hypotheses
12. Analysis of elasticity

1. Growth of Number of Factories

Details regarding growth of number of factories are given below in table-1 for the reference period under study.

Table-1

Growth of Number of Factories

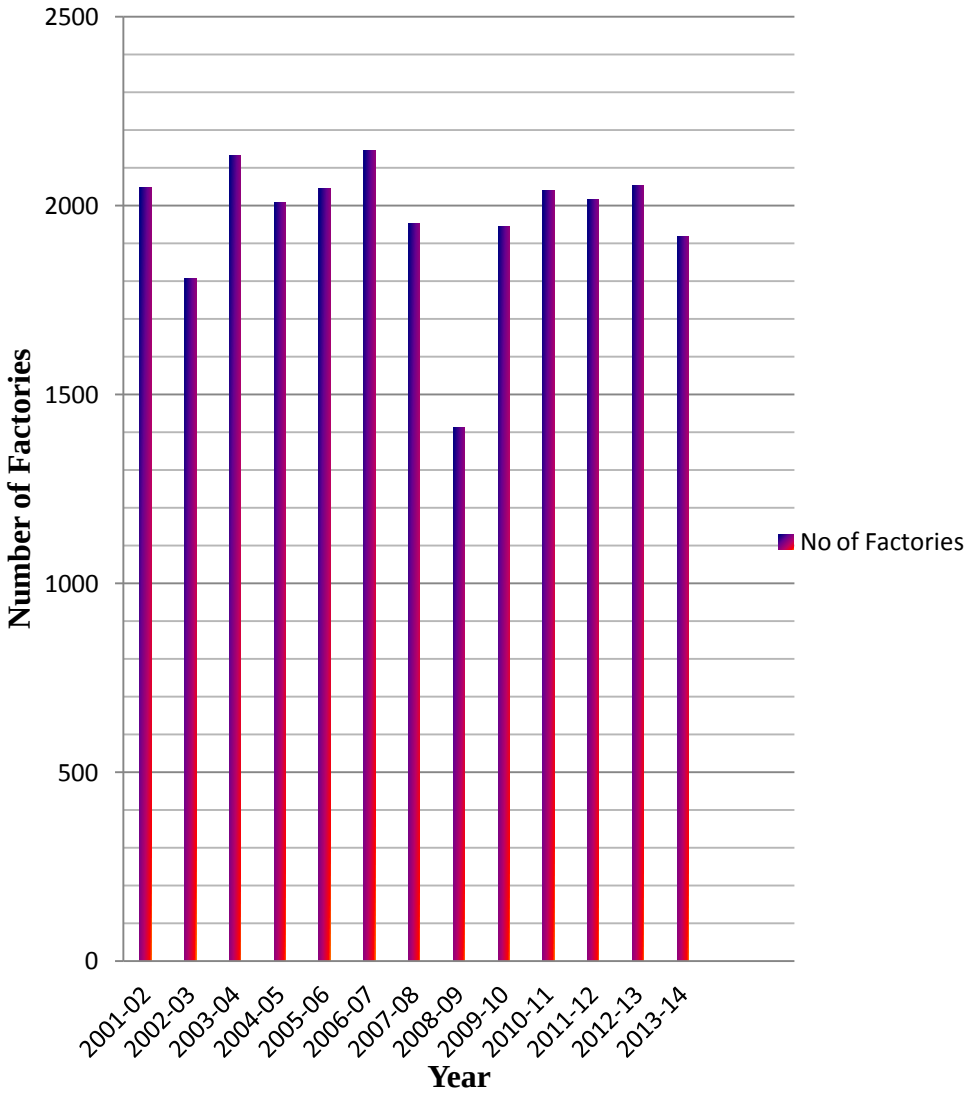
Year	No. of Factories	Annual Percentage Increase/ Decrease
2001-02	2048	-
2002-03	1806	-11.81
2003-04	2132	18.05
2004-05	2009	-5.76
2005-06	2046	1.84
2006-07	2146	4.89
2007-08	1953	-8.99
2008-09	1414	-27.60
2009-10	1946	37.62
2010-11	2040	4.84
2011-12	2017	-1.13
2012-13	2054	1.83
2013-14	1919	-6.57

Foot note: Calculations are based on ASI data

From the above table it is very clear that the annual percentage growth ranged between -1.13 percent and 37.62 percent across the years .The highest annual growth was recorded in the year 2009-2010 and the lowest in the year 2011-12.Through out the year there were mixed changes recorded with wider variations.Figure-1 illustrates the growth of number of factories.

Figure-1

Growth of Number of Factories



2. Geographical and Market Industrial Concentration

Geographical concentration is the ratio of industries to geographical area. Market concentration is a function of the number of firms and their respective shares of the total production (alternatively, total capacity or total reserves) in a market. In other words market concentration is related to industrial concentration, which concerns the distribution of production within an industry. The following table-2 shows details on percentage of geographical market industrial concentration.

Table-2

Percentage of Geographical and Market Industrial Concentration

Year	Geographical concentration	Market concentration
2001-02	6.23	4.88
2002-03	5.49	5.10
2003-04	6.48	4.11
2004-05	6.11	4.94
2005-06	6.22	6.76
2006-07	6.52	7.03
2007-08	5.94	7.92
2008-09	4.29	12.41
2009-10	5.92	11.63
2010-11	6.20	12.92
2011-12	6.13	15.75
2012-13	6.25	16.76
2013-14	6.23	19.04

Foot note: Calculations are based on ASI data

Indices of both geographical and market concentration shows that from the beginning of the period to the end of the period there were fluctuations only in market concentration. The geographical concentration ratios were ranging between 4.29 and 6.48 percent while the market concentration was ranging between 4.11percent 19.04 percent. Figure-2 illustrates comparison of geographical and market concentration over the reference period under study from 2001-02 to 2013-14. Table-3 provides percentage of per factory input share during the reference period under study.

Figure-2

Percentage of Geographical and Market Industrial Concentration

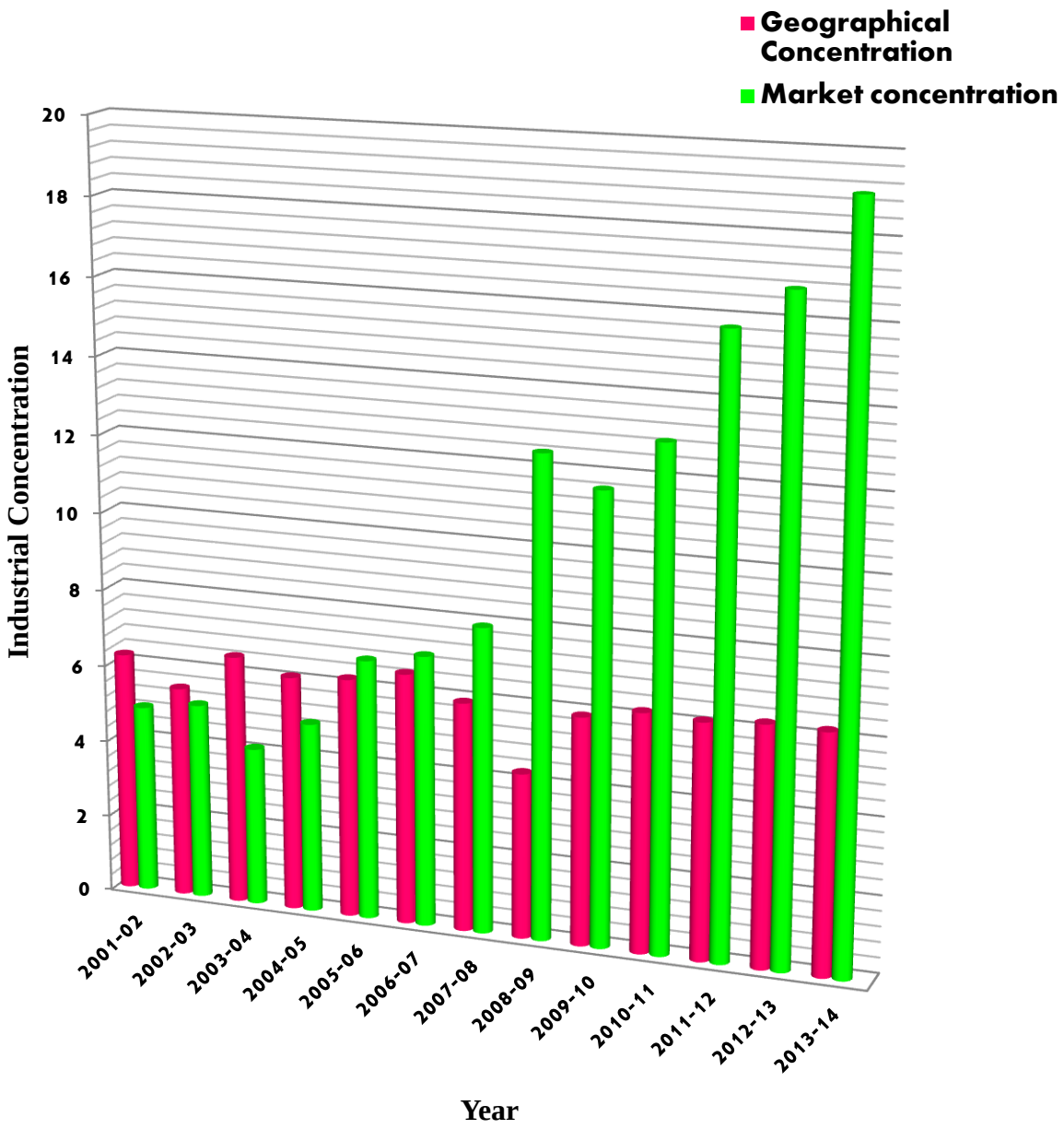


Table-3

Per Factory Input Share (in percentage)

Year	Labour	Capital
2001-02	4.88	95.12
2002-03	4.65	95.35
2003-04	4.25	95.75
2004-05	4.18	95.82
2005-06	4.41	95.59
2006-07	4.36	95.64
2007-08	4.74	95.26
2008-09	5.54	94.46
2009-10	4.88	95.12
2010-11	4.57	95.43
2011-12	4.70	95.30
2012-13	4.57	95.43
2013-14	4.56	95.44
Year	**Labour**	**Capital**

Foot note: Calculations are based on ASI data.

Details regarding per factory share of major inputs such as labour and capital explained the fact always capital share was more than 90 percent in these industries compared to labour employment throughout the reference period under study. Hence it is concluded capital is the major factor in maintaining gross output level of the manufacturing society.

3. Partial and Total Factor Productivity Indices

The indices of partial and total factor productivity along with their trend rates and magnitude of variability (C.V) are presented in table-4

Table-4

Indices of Partial and Total Factor Productivity

Year	LP	CP	TFP
2001-02	100	100	100
2002-03	109	93	101
2003-04	96	92	94
2004-05	118	100	109
2005-06	153	93	119
2006-07	161	101	128
2007-08	166	96	126
2008-09	223	116	160
2009-10	238	116	166
2010-11	282	132	193
2011-12	334	144	219
2012-13	366	132	220
2013-14	417	129	232
Average	212.5385	111.0769	151.3077
Standard deviation	107.99739	18.07605	50.25499
C.V	50.8131	16.27346	33.21377
R^2	.928	.755	.930
F-value	142.605*	33.893*	146.347*
Parameter(β)	26.720* (11.942)	4.033* (5.822)	12.445* (12.097)

Foot note: Calculations are based on ASI data.

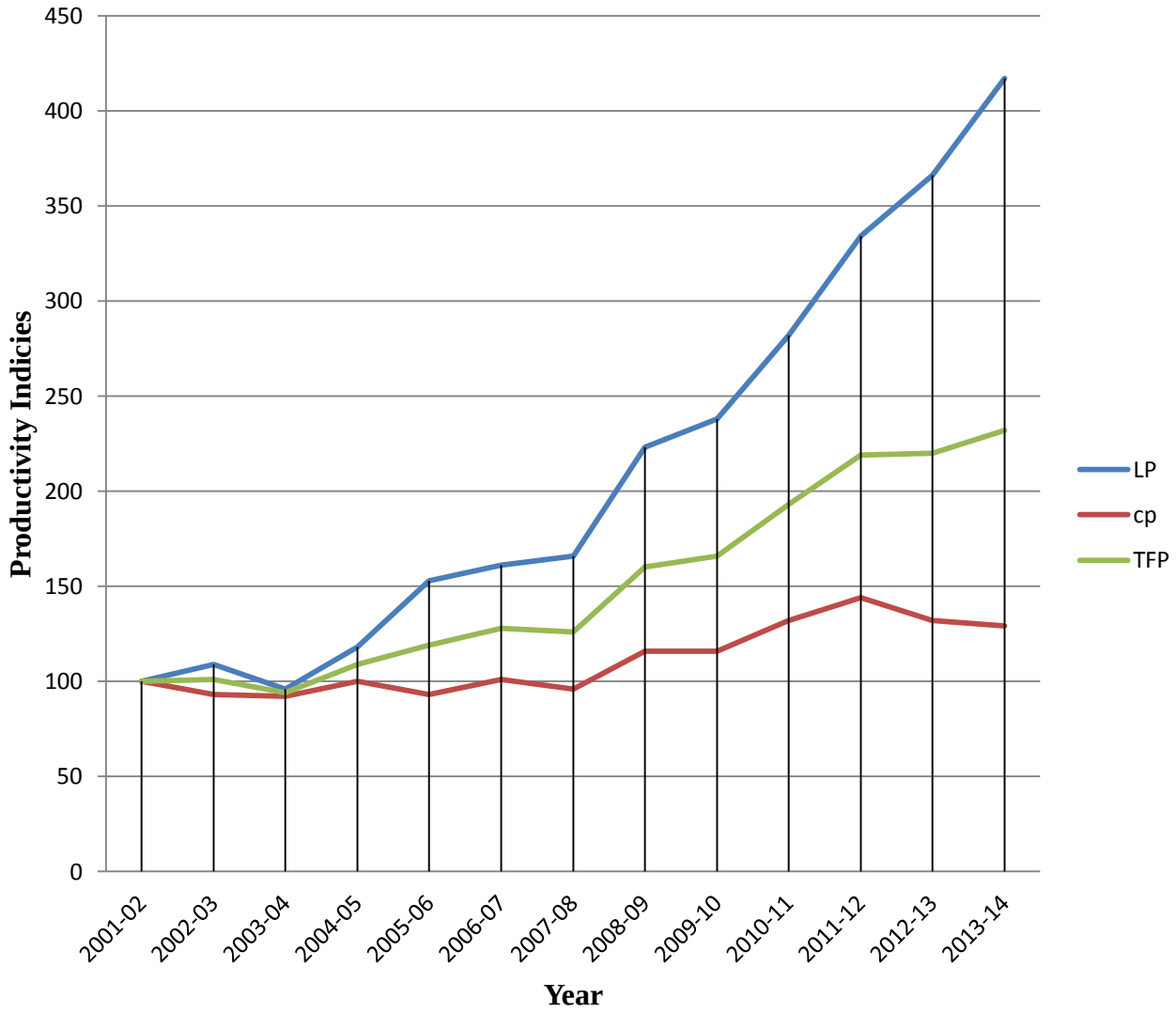
Figures in bracket indicates't'- values

The detailed time trend estimates revealed that labour productivity (LP) index had shown an increasing trend up to the period 2013-14. This accounted for more than 4 fold increase. The average annual trend rate of growth of labour Productivity (LP) was 26.72 percent for the entire period. The index of capital productivity (CP) had also shown an increasing trend but the increase had not been uniform recording 4.03 percent annual trend rate. The index fluctuated throughout the study period. Indices of Total Factor Productivity (TFP) brought out the fact the increase was noticeable. The trend rates explained that the indices of Total Factor Productivity (TFP) had shown a positive growth of 12.45 percent, Figure –3

Explains the movement of partial indices through the reference period under study for the co-operatives manufacturing society.

Figure-3

Indices of Partial and Total Factor Productivity



4. Wages and Earnings

The following table-5 gives facts regarding the indices growth of wages and earnings during the reference period under study

Table- 5

Indices of Wage Rate and Earnings Per Employee

Year	Wage Rate Per Worker	Earning Per Employee
2001-02	100	100
2002-03	99	93
2003-04	100	95
2004-05	111	100
2005-06	121	109
2006-07	122	112
2007-08	143	129
2008-09	155	133
2009-10	186	151
2010-11	122	190
2011-12	151	206
2012-13	271	234
2013-14	299	134

Foot note: Calculations are based on ASI data

The table clearly explain the fact that the earnings per employee was less than the per worker wage rate throughout the period .The comparatively higher increase in wages per worker in the co-operative manufacturing society may be due to the catching up effect because the wage has been low during the initial period. The rapidly rising index of wage rate clearly suggests that the manufacturing sector has failed to shift the burden of rising wage bill to the customers.

5. Factor Intensity

Details on factor intensity is presented below in table-6

Table-6

Indices of Factor Intensity

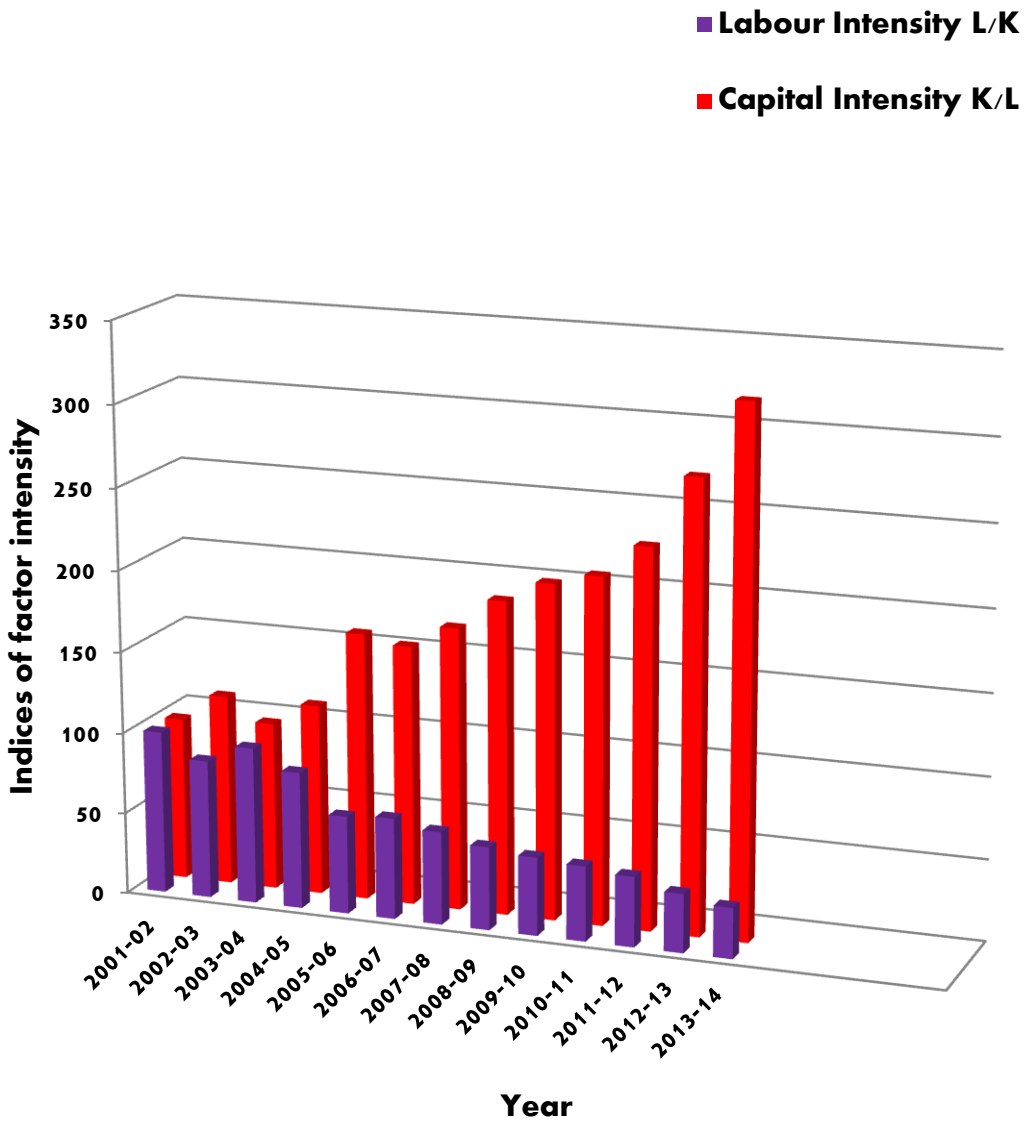
Year	Labour Intensity (L/K)	Capital Intensity (K/L)
2001-02	100	100
2002-03	85	117
2003-04	96	103
2004-05	84	117
2005-06	60	164
2006-07	62	159
2007-08	57	173
2008-09	51	192
2009-10	48	205
2010-11	46	212
2011-12	43	232
2012-13	36	275
2013-14	31	321
Average	61	182
Standard deviation	21.85	64.65
C.V	35.55	35.46

Foot note: Calculations are based on ASI data

The above facts explain that as expected capital intensity was more than the labour intensity throughout the reference period under study. Also the indices of labor intensity gradually declined where as capital intensity was showing gradual increase. This is also evident based on the average growth. But there were no much differences in the magnitude of variability in their growth. Figure-4 illustrates the same.

Figure-4

Factor Intensity



6. Factor Efficiency

Details on factor efficiency relating to capital and labor is shown in table-7

Table-7

Indices of Factor Efficiency

Year	Labour efficiency (L/O)	Capital efficiency (K/O)
2001-02	100	100
2002-03	91	106
2003-04	103	107
2004-05	84	99
2005-06	65	107
2006-07	61	98
2007-08	59	103
2008-09	44	86
2009-10	41	86
2010-11	35	75
2011-12	29	69
2012-13	27	75
2013-14	27	87
Average	58.92	92.15
Standard deviation	26.85	12.76
C.V	45.58	13.85

Foot note: Calculations are based on ASI data

It is disappointing to note that the efficiency of both the factors have declined at the end of the reference period in the Indian co-operative manufacturing sector. But the comparison of the individual factor showed that labour efficiency was always far behind the capital efficiency. The efficiency of capital input was stable compared to labour efficiency based on the co-efficient of variation.Table-6 gives details on per factory profit over time.

7. Factor's Share in Total Input

The share of labour and capital inputs in the total input component is shown in table-8

Table-8

Factor's Share in Total Input

Year	%share in input(I)	
	Labour L/I	Capital K/I
2001-02	8.25	91.75
2002-03	7.41	92.59
2003-04	8.11	91.89
2004-05	6.77	93.23
2005-06	5.40	94.6
2006-07	5.18	94.82
2007-08	4.69	95.31
2008-09	3.48	96.52
2009-10	3.24	96.76
2010-11	2.73	97.27
2011-12	2.30	97.7
2012-13	2.10	97.9
2013-14	1.86	98.14

Foot note: Calculations are based on ASI data

The share of labour in total factor input had gradually declined to 1.86 percent and the share of capital increased conversely. Thus the importance of labour in the industry as an input has been continuously decreasing. Theses points to the rising capital intensity in the co-operative manufacturing society of India.

8. Production function estimates

The technical progress of these sectors were analyzed by calculating marginal productivity labour (MP_L), marginal productivity of capital (MP_K), Marginal Rate of Technical Substitution of labour for capital ($MRTS_{LK}$) and capital intensity (K/L). Marginal productivity or co-efficient of capital (MP_K) may be defined as the ratio between a change in output in a given economy of industry for a given time period and change in

gross block of that economy. Marginal productivity of labour (MP_L) may be defined as the ratio between a change in output in a given economy or industry for a given period and change in amount of labour use. Capital intensity (K/L) is nothing but the state of technology. The $MRTS_{LK}$ explains the rate at which substitution was taken place between labour and capital.

a. Growth of MP_L ratios

The trends in the growth of Marginal Productivity of Labour (MP_L) are presented in table-9

Table-9

Trends in MP_L Ratios

Year	MP_L Ratios
2001-02	-0.809
2002-03	-0.7083
2003-04	-0.8442
2004-05	-0.6172
2005-06	-0.2437
2006-07	-0.1583
2007-08	-0.1
2008-09	0.50518
2009-10	0.65631
2010-11	1.12464
2011-12	1.67977
2012-13	2.01677
2013-14	2.55864
Average	0.389
Standard deviation	1.101
C.V	282.84

Foot note: Calculations are based on ASI data

An average MP_L ratio during the period was 0.389. Wider variations were observed during the reference period under study with positive and negative ratios. This is also evident based on the co-efficient of variation (C.V) .The variations in MP_L ratios might due to wage differentials across the time.

b. Growth of MP_K ratios

Table-10 presents details regarding trends in MP_K ratios.

Table-10

Trends in MP_K Ratios

Year	MP_K Ratios
2001-02	2.63069
2002-03	2.34206
2003-04	2.31418
2004-05	2.63525
2005-06	2.32162
2006-07	2.68245
2007-08	2.46395
2008-09	3.36317
2009-10	3.35265
2010-11	4.10196
2011-12	4.61161
2012-13	4.11205
2013-14	3.98045
Average	3.14
Standard deviation	0.78
C.V	24.93

Foot note: Calculations are based on ASI data

The MP_K ratios during the reference period were positive. This shows that capital contributed positively to output. On an average, these enterprises have recorded the maximum productivity performance of 3.1470 units with maximum variation of 24.93 percent.

c. Growth of $MRTS_{LK}$ ratios

The trend in the growth of co-operation manufacturing society $MRTS_{LK}$ of is presented in table-11.

Table-11

Trends in $MRTS_{LK}$ Ratios

Year	$MRTS_{LK}$ Ratios
2001-02	-0.30752
2002-03	-0.30243
2003-04	-0.36479
2004-05	-0.23421
2005-06	-0.10497
2006-07	-0.05901
2007-08	-0.04059
2008-09	0.150209
2009-10	0.195759
2010-11	0.274171
2011-12	0.364248
2012-13	0.490454
2013-14	0.642802
Average	0.05
Standard deviation	0.31
C.V	578.07

Foot Note: Calculations are based on ASI data

The $MRTS_{LK}$ ratios during the period under study showed that all the ratios were mixed. The mean $MRTS_{LK}$ was 0.054163.Across the years the growth of the ratios was not stable since the magnitude of variability was 578.0731 percent.

d. Production function estimates

The estimates production function is presented in table-12.

Table-12

Estimates of Production Function

Variables	Co-efficient
A (Constant)	-1.869* (-4.668)
Capital **(β1)**	1.321* (17.707)
Wages **(β2)**	.073 (1.111)
Economics of scale **(S)**	1.394
R^2	0.974
D.W Statistics	0.834
Percentage Share of Capital (β1/S)	0.947
Percentage Share of Labour (β2/S)	0.052

Source: Calculations are based on ASI data

Foot note: Figures in parentheses are t-values

*Significant at 1% level

Efficiency parameter 'A' is negative and statistically significant The implication is that the organizational efficiency is low, negatively contributes to output and its contribution was explicitly not significant in output generation.Elasticity of capital with respect to output (β1) was positive and statistically significant. An encouraging features noticed from the results was that wage co-efficient was positive and statistically insignificant. This implied that wage did not contribute significantly to output. The sum of the coefficients implies that it had recorded increasing returns to scale. The percentage share of factor inputs presented in the table indicated that share of wages was less than the share of capital in this sector. This implied that these enterprises were capital intensive in their operation.

9. Sources of productivity growth

The sources of productivity change in this sector is presented in Table-13

Table – 13

Multiple Linear Regression Co- efficients

Dependent Variable	Coefficient of							
	Constant	**LnOUT**	**LnOUT**	**Ln K/L**	**LnT**	**R^2**	**DW – Statistic**	**F-ratio**
Ln OUT/L	5.062 .217	.894 (5.708)	-.148 (-.485)	.182 (.627)	2.703 (.778)	.998	2.836	360.563**
Ln OUT /K	107.336** (7.950)	.348* (3.835)	-.035 (-.602)	.449 (2.668)	3.203 (1.593)	.901	2.594	28.329
Ln TFPI	5.277 (.224)	.890* (5.619)	-.148 (1.469)	.184 (.627)	2.803 (.797)	.994	2.295	139.506*

Foot note: Calculations are based on ASI data

(i) Figures in parantheses are't' values of the estimates;

(ii) *Significant at 1% level;

(iii) **Significant at 5% level;

The results regarding determinants of productivity in the co-operative manufacturing society of India showed that output (Ln OUT) was positively related to labour productivity (Ln OUT/L), capital productivity (Ln OUT / K) and also to total factor productivity index (LnTFPI). The increase in output (Ln OUT) might have increased productivity over the period because of (i) technical progress and (ii) economies of scale (both internal and external). The negative association between total factor productivity (Ln OUT /L) and wage rate (Lnw) indicated that higher wages resulted in lower productivity –disapproving efficiency–wage hypothesis. The significant negative relationship between labour productivity (Ln OUT/L) and capital intensity (LnK/L) implied that the presence of too many machines had brought down the productivity. The co-efficient of time (LnT) was positively related to all partial factor productivity indices. This implied that labour management relation and other institutional factors have adversely affected productivity in these industries. The co-efficient of R^2 explained the fact that more than 90 percent of changes were brought about

by the factors such as output (Ln OUT), wage rate (LnW) capital intensity (LnK/L) and time element (T) and the remaining percentage change was due to other unexplained variables.

10. Important theoretical law/hypotheses

Table-14 shows details regarding the major law/hypothesis relating to ability to pay hypothesis and Verdoorn's law.

Table-14

Co-efficients of Important Theoretical Law/Hypotheses Tested

Test	Constant	Labour productivity	Output	Capital intensity	R^2	F-statistic
Ability to pay hypothesis	33.01	0.033* (9.9955)	-	-	0.908	99.11*
Verdoorn's law	154.89	_	15.011* (26.085)	-	0.986	98.14

Foot note: (i) Calculations are based on ASI data

(ii) Figures in parantheses are t' values of the estimates;

(ii) *Significant at 1% level;

11. Relative importance of Technology on Wage, Output and Labour Productivity

In order to draw an emphatic conclusion, the co-efficient of correlation was calculated to examine the strength of the relationship between a. technology and labour productivity b. technology and wage rates and c. labour productivity and wage rate.Table-15 shows details regarding correlation co-efficients.

Table-15

Co-efficients of Correlation

Relationship of technology with	Co-efficient
Labour productivity	.981
Output	.996
Wage rate	0.452

Foot note: Calculations are based on ASI data

The results showed that the correlation between technology (capital intensity) and labour productivity and technology and output were very strong. It was 0.981 and .996 respectively which implied that technology has a strong influence on the measurement of labour productivity and output of these industries. The value of correlation was relatively low between wage rate and capital intensity.

12. Analysis of Elasticity

In this section the investigator had made an attempt to analyze various elasticities namely employment elasticity, output elasticity and wage elasticity by applying regression model. The results are presented in table-16

Table-16

Regression Co-efficients

Elasticity	Constant (A)	Y_t	K_t	L_t	Lp_t	R^2	DW-Statistic	F-value
Employment elasticity	88.269 10.727*	.005 .055	.009 .056	-	-	.032	2.310	.167
Output elasticity	-73.531 -.776	-	1.579 15.964*	.058 .055	-	.963	1.460	131.797
Wage elasticity	-127.423 -.604	.240 1.756	-	-	2.342 .993	.326	1.665	1.665

Foot note: Calculations are based on ASI data

Employment elasticity with respect to output was positive but statistically significant co-efficient was not found. Positive elasticity with respect to fixed capital was observed. This implied that fixed capital is considered to be a substitute for labour to a larger extent. The output elasticity with respect to employment showed that it was positive but it was statistically insignificant. The co-efficient of determinant R^2 showed that it was high for only output elasticity model implying the fact that 96.3 percent of the variation in the dependent variable was due to the combined effect of the independent variables namely fixed capital and number of workers. Wage elasticity with respect to labor productivity and output showed that, positive elasticity co-efficient were observed. This implied that when wage rate increases labour productivity and output will also be increase.

SUMMARY AND CONCLUSION

V. SUMMARY AND CONCLUSION

The Industrial economy of the country today is passing through vast upheavals. The responsibility for rapid industrialization development only on the part of the government is not possible immediately and is a long term phenomenon because limited resources and diversified socio economic activities. Whereas the need of the hour is speedy industrial development. The private sector is mainly concentrating on medium and large-scale industries yielding profits. This sector mainly guides exploitation without consideration of public interest. On the other, the public sector in mainly concentrating on public utilities, strategic production and industries of national importance. This sector is known for its bureaucratic efficiency, delay, incurring of losses etc. The co-operative sector is mainly undertaking production activities of village industries, cottage industries, small scale units and Agro- based industries. This sector is most suitable for organizing there industries and other crafts of artisans and to preserve traditional industries.

The co-operative sector acts as a balancing factor between private and public sector. Industrial co-operative play an important role in the process of industrialization in India. The importance of the co-operative sector as one of the industrial sector cannot be over emphasized. The industries in co-operative sector represent a new dimension in India industrial structure

The socialistic pattern of society implies of decentralized units. The establishment of a large number of decentralized industries offers vast scope for the application of co-operative principles. In a country like India where capital is shy, low rate of capital formation, literacy among artisans, economic imperfection, poor enterprise and organizational ability are the associated features. The co-operate sector has emerged and played an important role in solving many of these problems. The sector combines in itself the merits both of public and private sectors and eliminates their defects. Co-operative industrial sectors provides a substitute for the profit motive in business organization, ensures equitable distribution of income and wealth, curbs monopolistic concentration and promotes decentralization in industrial structure and balanced regional development.

Considering the important role played by industrial co-operatives the study has been under taken with the following objectives: They are to analyse

1. Trends in the growth of number of factories, wages and earnings, factor intensity, factor efficiency, factor's share in total input, geographical and market industrial concentration, partial and total factor productivity indices.
2. Production function estimates and sources of productivity growth.
3. Relative importance of technology on wage, output and labor productivity.
4. Approval /disapproval of important theoretical law/hypothesis.
5. Analysis of elasticity-wage, output and employment elasticity. It is hoped that the findings and conclusions emerging out of this study would be of immense use to the policy makers of this particular area and evolve policies for the future growth.

Methodology

Gross output was taken as output, since trends are not affected significantly by the use of gross output. Also ambiguity in the calculation of depreciation can be overcome if gross output is taken as a measure of output. Labour input consisted workers directly involved in production and employees other than workers. The fixed capital was taken into account as capital input. Wages included remuneration paid to workers. Emoluments are considered as remuneration paid to the employees. The basic data source of the study was Annual Survey of Industries (ASI) published by Central Statistical Organization (CSO), Government of India covering the period from 2001-02 to 2013-14.All the referred variables were normalized by applying Gross Domestic Product (GDP) deflator. The GDP at current and constant prices were obtained by referring to Economic Survey, published by Government of India, Ministry of Finance and Economic Division, New Delhi.

Statistical tools such as productivity indices, linear regression models, Cobb-Douglas production function, ratios, compound annual growth Rate , co-efficient of variation, co-efficient of correlation , annual variation, base year indices, percentages, graphs, diagrams and ratios were used to analyze the data. The major findings of the study are as follows:

Results and discussion

- The annual percentage growth varied between -1.13 percent and 37.62 percent across the years .The highest annual growth was recorded in the year 2009-2010 and the lowest in the year 2011-12.Through out the year there were mixed changes recorded with wider variations.

- Indices of both geographical and market concentration showed that from the beginning of the period to the end of the period there were fluctuations only in market concentration. The geographical concentration ratios were ranging between 4.29 and 6.48 percent while the market concentration was ranging between 4.11percent 19.04 percent.
- Always capital share was more than 90 percent in these industries compared to labour employment throughout the reference period under study.
- Labour productivity (LP) index had shown an increasing trend up to the period 2013-14. This accounted for more than 4 fold increase. The average annual trend rate of growth of labour productivity (LP) was 9.28 per cent for the entire period
- The index of capital productivity (CP) had also shown an increasing trend but the increase had not been uniform recording 7.55 percent annual trend rate. The index fluctuated throughout the study period.
- Indices of total factor productivity (TFP) brought out the fact the increase was noticeable. The trend rates explained that the indices of total factor productivity (TFP) had shown a positive growth of 9.30 percent.
- The earnings per employee was less than the per worker wage rate throughout the period. The comparatively higher increase in wages per worker in the Indian manufacturing may be due to the catching up effect because the wage has been low during the initial period.
- As expected capital intensity was more than the labour intensity throughout the reference period under study. Also the indices of labor intensity gradually declined where as capital intensity was showing gradual increase. This was also evident based on the average growth. But there were no much differences in the magnitude of variability in their growth.
- The comparison of the individual factor showed that labour efficiency was always far behind the capital efficiency. The efficiency of capital input was stable compared to labour efficiency based on the co-efficient of variation.
- The share of labour in total factor input had gradually declined to 1.86 percent and the share of capital increased conversely. Thus the importance of labour in the industry as an input has been continuously decreasing.

- Average MP_L ratios during the period was0.389. Wider variations were observed during the reference period under study with positive and negative ratios. This was evident based on the co-efficient of variation.
- The MP_k ratios during the reference period were positive. This showed that capital contributed positively to output. On an average, these enterprises have recorded the maximum productivity performance of 3.1470 units with maximum variation of 24.93 percent.
- The $MRTS_{LK}$ ratios during the period under study showed that all the ratios were mixed. The mean $MRTS_{LK}$ was 0.0541. Across the years the growth of the ratios was not stable since the magnitude of variability was 578.0 percent.
- Efficiency parameter 'A' was negative and statistically significant The implication was that the organizational efficiency was low, negatively contributed to output and its contribution was explicitly not significant in output generation
- Elasticity of capital with respect to output (β1) was positive and statistically significant. Wage coefficient and positive statistically insignificant. This implied that wage did not contribute significantly to output.
- The sum of the coefficients of labour and capital based on Cobb-Douglas production function implied that it had recorded increasing returns to scale. The percentage share of factor inputs presented indicated that share of wages was less than the share of capital in this sector implying that these enterprises were capital intensive in their operation.
- Total output (Ln OUT) was positively related to labour productivity (Ln OUT/L), capital productivity (Ln OUT / K) and to total factor productivity index (LnTFPI). The negative association between total factor productivity (Ln OUT /L) and wage rate (Lnw) indicated that higher wages resulted in lower productivity –disapproving efficiency–wage hypothesis
- The significant negative relationship between labour productivity (Ln OUT/L) and capital intensity (LnK/L) implied that the presence of too many machines had brought down the productivity.
- The co-efficient of time (LnT) was positively related to all partial factor productivity indices. This implied that labour management relation and other institutional factors have adversely affected productivity in these industries.

- The co-efficient of R^2 explained the fact that more than 90 percent of changes were brought about by the factors such as output (Ln OUT), wage rate (LnW) capital intensity (LnK/L) and time element (T) and the remaining percentage change was due to other unexplained variables.
- Regression results for the ability to pay hypothesis explained the fact that the co-efficient of R^2 was 0.908 which meant that 90.8 per cent of the variations in wage around its mean were explained by labour productivity.
- Verdoorn's law was also proved in these industries. In other words a close relationship between labour productivity and output was observed based on the R^2 value and regression co-efficient.
- The correlation between technology (capital intensity) and labour productivity and technology and output were very strong. It was 0.981 and .996 respectively which implied that technology had a strong influence on the measurement of labour productivity and output of these industries. The value of correlation was relatively low between wage rate and capital intensity.
- Employment elasticity with respect to output was positive but statistically insignificant. Positive elasticity with respect to fixed capital was observed. This implied that fixed capital was considered to be a substitute for labour to a larger extent.
- The output elasticity with respect to employment showed that it was positive but it was statistically insignificant. The coefficient of determinant R^2showed that, it was high for only output elasticity model implying the fact that 96.3 percent of the variation in the dependent variable was due to the combined effect of the independent variables namely fixed capital and number of workers.
- Wage elasticity with respect to labor productivity and output showed that, positive elasticity co-efficient were observed. This implied that when wage rate has increased labour productivity and output will also be increased.

Conclusion

Capital was the major factor in maintaining gross output level of the manufacturing society. The comparatively higher increase in wages per worker may be due to the catching up effect because the wage has been low during the initial period. The rapidly rising index of wage rate clearly suggested that the manufacturing sector has failed to shift the burden of rising wage bill to the customers. It was found that labour efficiency was instable. In order increase the efficiency of labor force in this manufacturing sector, efforts should be taken to increase wages and fringe benefits to promote the efficiency of labour. When wages and incentives will increase, it will make the laborer hard worker and efficient. Vocational, technical and commercial colleges should be opened to provide technical skill to the work force. Modern industry, agriculture, banking, transport and commerce require highly skilled persons. Health facilities should be provided to the laborers. A healthy worker can work more efficiently as compared to sick worker. All the factory owners should open the health clinics in their factories and regular medical check-up should be compulsory. Various types of allowances like dearness and bonus must be increased. Special allowances should be given to the efficient workers. Government should also frame the strict labour laws. In case of accident, special compensation should be given. In case of industrial dispute, courts should be established. This step will provide the security to the labourers and they will work with full concentration. To provide the goods on lower rates to the labourers, special stores should be opened for the workers. The variations in MP_L ratios might be due to wage differentials across the time.

BIBLIOGRAPHY

BIBLIOGRAPHY

- **Abrelaez Maria and Angelicm Parra Torrado Monica** (2011) "Innovation, research and development investment and productivity in Colombian firms", working papers, code: IDB, No.251.
- **Afzal.M** (2006) "Some new production measurement methods for large-scale manufacturing sector of Pakistan". PhD Dissertation (unpublished) submitted to National College of Business Administration and Economics.
- **Ambili Kuma.V** (1999) "Productivity: A challenge before the Coir Co-operatives", Co-operative Perspective, Vol.XXXIV, Pp.9-I3.
- **Ana . M Fernandez and Gunjan Sharma** (2012) "Determinants of clusters in Indian manufacturing: the role of infrastructure, governance, education, and industrial policy", http://www.theigc.org/wp-content/uploads/2015/02/ Discussion Paper No. 51 Pp.31
- **Arnab.K Deb and Subhash.C Ray,** (2014) "Total Factor Productivity Growth in Indian Manufacturing: A Biennial Malmquist Analysis of Inter-State Data", Vol: 49, Pp. 1-25.
- **Arpad.J Abraham.T and Kirk White** (2006) "The Dynamics of Plant-Level Productivity in U.S. Manufacturing", Paper Provided By Center for Economic Studies", U.S. Census Bureau in its series working papers with No.06-20.
- **Arza Valeria and Lopez Andres** (2010) "Innovation and productivity in the Argentine manufacturing sector", working papers, August 2010, code: IDB-No.187.
- **Athreye Suma Kapur and Sandeep** (2004-10) Department of Economics, Open University Series: Open Discussion Papers in EconomicsSubjects: "industrialconcentration liberalisation India" Type of Publication: Book / Working Paper Notes: No. 51 Pp.32
- **Baliyan Sandeep Kumar and Baliyan Kavita** (2015) "Determinants of firm-level performance: a study of Indian manufacturing and service sectors", Vol. 11, Pp. 701-713.
- **Bantekas.P** (2008) "Multifactor productivity in the construction industry under imperfect competition", ICFAI Journal of Industrial Economics, Vol.5, No.3, Pp.28-35.

- **Basti .Y and Akin. A** (2008). "The comparative productivity of the foreign-owned companies in Turkey: a Malmquist productivity index approach". International Research Journal of Finance and Economics, Vol-22, No.3, Pp.1450-2887.
- **Biswanth Golder** (2001) "Technology acquisition and productivity growth- a study of large chemical firms in India", The Asian Economic Review, Vol.43, No.2. Pp. 457-469.
- **Bjurek .H and Durevall.D** (2000) "Does market liberalization increase total factor productivity? Evidence from the manufacturing sector in zimbabwe". Journal of Southern African Studies. Vol.26, No.3, Pp. 463-479.
- **Burange. L. G and Rucha R. Ranadive** (2015) "Inter-State analysis of the organised manufacturing sector in India", Vol.03 Pp.43-53.
- **Burki. A. A and Mahmood ul Hassan. K** (2005) "Effects of allocative inefficiency on resource allocation and energy substitution in Pakistan's Manufacturing". Lahore University of Management Sciences. CMER working paper No. 04-30.
- **Ceyhun Elgin and Tolga Umut Kuzubas** (2012) "Wage-productivity gap in Turkish manufacturing sector", paper provided by Bogazici University, Department of Economics in its series working papers with No.203.
- **Chidambara.G and Iyer** (2013) "Urbanization in India and productivity of manufacturing industries": an empirical study, Vol: 48 Pp: 297-322.
- **Crespi and Gustavo Zuniga Pluvia** (2010) "Innovation and productivity: evidence from six latin American countries", working papers, August 2010,code: IDB-WP-218
- **Dana Hajková** and **Jaromír Hurník** (2007) "Cobb-Douglas production function: the case of a converging economy". Journal of Economics and Finance, Vol.57, No.9, Pp.465.
- **Danish. A Hashim Ajay Kumar and Arvind Virmani** (2011) "J-Curve Hypothesis of Productivity and Output Growth: A Case Study of Indian Manufacturing in the Post Reforms Period". Vol: 4, No.6, Pp. 1-21.
- **Deb Kusum Das** (2004) "Manufacturing productivity under varying trade regimes", 1980-2000, Economic and Political Weekly, Vol.39, No.5, Pp.423-433.
- **Eva Yamila Catela,Cario Cimoli and Gabriel Porcile** (2012) "Productivity and structural heterogeneity in the Brazilian manufacturing sector: trends and determinants", paper provided by Laboratory of Economics and Management (LEM), Sant'anna School of Advanced Studies, Pisa, Italy in its working paper with,No.20.

- **Eze, Onyekachi Richard and Dr. Ogiji, Festus.O** (2013) "Impact of fiscal policy on the manufacturing sector output in Nigeria: an error correction analysis", Vol.1, No.3, Pp. 35-55.
- **Fare.R Grosskopf.S and Lee.W.F** (1995) "Productivity in Taiwanese manufacturing industries", Applied economics, Vol.27, No.3, Pp. 259-265.
- **Färe.R Grosskopf.S and Margaritis .D** (2001) "Productivity trends in Australian and New Zealand manufacturing". Australian Economic Review, Vol.34, No.2, Pp. 125-34.
- **Fu.X** (2005) "Exports, technical progress and productivity growth in a transition economy: a nonparametric approach for china", Applied Economics, No.37, Pp. 725–39.
- **Fulwinder Pal Singh** (2012) "Economic reforms and productivity growth in Indian manufacturing sector–an interstate analysis, International Journal of Marketing", Financial Services and Management Research, Vol.1, No.12, Pp.1
- **Ganna Vakhitova and Tetyana Pavlenko** (2010) " Innovation and productivity: a firm level study of Ukrainian manufacturing sector, paper provided by KYIV school of economics in its discussion papers with N0. 27.
- **Ghuman .B.S and Manga, Anil** (1987) "Performance of co-operative sugar mills in Punjab", Indian Co-Operative Review, Vol. 25(1), Pp. 65.
- **Gomathi and Manonmani. M** (2008) "Performance of manufacturing sector of Tamil Nadu in the pre and post liberalization period" – Post graduate thesis.
- **Hay. D.A** (2002) "The post-1990 Brazilian trade liberalization and the performance of large manufacturing firms: productivity, market share and profits", the Economic Journal, Vol. 3, No. 473, Pp. 620-641.
- **Isbella Rani and S. Krishnamoorthi** (1993) "Rural Industrialisation - The case of coir Industry" Journal of Rural Development, Vol.'12. No.5, Pp.523-531.
- **Jacques Yanyun and Zhao Zhen** (2012) "Globalization, innovation and productivity in manufacturing firms: a study of four sectors of china", ERIA discussion paper.
- **Jajri, Idris and Ismail,Rahmah** (2013) "Technical efficiency, technological change and total factor productivity growth in Malaysian manufacturing sector ", MPRA paper , University of Malaya, No.11. Pp. 22-14.
- **Jeyamalathi and Manonmani.M** (2004) "Productivity in selected manufacturing industries in TamilNadu" – post graduate thesis.

- **Kirtti Ranjan Paltasingh and .R.K Mishra** (2015) "Economic reform and industrial productivity: testing the j-curve hypothesis at state level", Vol. 95, Pp. 379.
- **Lili Wang and Adam Szirmai** (2008) "Productivity growth and structural change in chinese manufacturing industries, 1980-2000", Industrial and Corporate change, Vol-1, No-4, Pp. 203-235.
- **Madheswaran. S Badri Naryan Rath and Hailin Liao** (2007) "Productivity growth of Indian manufacturing sector: panel estimation of stochastic production frontier and technical inefficiency", Journal of Development Areas, Vol.40, No.2,Pp.1.
- **Mahmood .T Ghani .E and Din .M** (2007) "Efficiency of large scale manufacturing in Pakistan: a production frontier approach". Working paper, Pakistan Institute of Development Economics,No.27.
- **Maniklal Adhikary and Ritwik Mazumder** (2009) "Economic reforms and productivity change in selected Indian industry", published by J.K Singh for Abhijeet publication, Delhi.
- **Manjappa .D.H Mahesha .M** (2008). "Measurement of productivity growth, efficiency change and technical progress of selected capital-intensive and labour intensive industries during reform period in India", Indian Journal of Economics and Business,Vol. 5 ,No.4, Pp. 57-65.
- **Manjit Sharma** (2010) "Growth and productivity trends in organised manufacturing sector of punjab: a study of selected industries" Vol. 10, No. 361.
- **Manoj.K Sharma and Rajiv Khosla** (2013) "Regional disparities in India's industrial development:discriminant function approach ",The Indian Journal of Industrial Relations, Vol. 48, No. 4 ,Pp.703-710.
- **Manonmani.M (2012)** "Determinants of productivity based on the indices of partial and total factor productivity in rural, urban and aggregate industries of India". Journal of Economic Review, Vol:54 , pp.111
- **Manonmani. M** (2015) "Efficiency in the manufacture of fabricated metal products in India", Research High lights JADU, Vol.25, Pp. 54. -62.
- **Manonmani. M** (2015) "Measuring technical, scale, cost and allocative efficiency in the manufacture of basic metals in India using Data Envelopment Analysis" Journal of Indian Research Vol.1, No.3, Pp, 36-42.

- **Manonmani .M** (2014) "Impact of economic reforms on productivity performance of manufacturing sector in South India" The Indian Journal of Industrial Relations,Vol.50,No.2, Pp.232-242
- **Manonmani .M and Gayathri.B.** (2008) "Productivity employment and wages in the aggregate manufacturing sector of India" – Post Graduate Thesis.
- **Manonmani .M and Gomathi** (2008) "Productivity, employment and wages in the aggregate manufacturing sector of India" – Post Graduate Thesis.
- **Manonmani** (2011)" Efficiency of transport equipment industry in India a stochastic frontier production function approach vol: 1, Pp 63-71
- **Manonmani .M and Nithya. G** (2012), "Determinants of industrial productivity in India before and after liberalisation -an application of discriminant function, Review of Professional Management, Vol.10, No.2,. Pp.60-64
- **Manonmani .M and Ramya** (2011), "Efficiency of India's Intermediary Goods Industries In The Liberalized Regime The Indian Journal of Industrial Relations, Vol.46, January, No.43, Pp.435-449.
- **Manonmani .M (2013)** "Productivity linked wage in the manufacture of paper and paper in Tamil Nadu", Review of Professional Management- A Journal of New Delhi Institute of Management, Vol .1, Pp.33-41.
- **Manonmani.M** (2013) "Trends in factor productivity and productivity gains in the aggregate manufacturing sector of India in the pre-and post-liberalization period" Journal of Economic Policy and Research, vol-8,No.2.
- **Manonmani.M** (2014) 'Total factor productivity of Indian corporate manufacturing sector",The Indian Journal of Industrial Relations, vol.49, No.3, Pp.513-525.
- **Manonmani.M and Geetha K.T** (2013) " Productivity linked wage in the manufacture of paper and paper products in Tamil Nadu" Journal of Economic Policy and Research, vol XIVC, No. 1,Pp 73-88
- **Manonmani.M and Geetha K.T** (2013) " Wage productivity in the manufacture of food products and beverages in the state of Tamil Nadu" research highlights vol:23,No.1,Pp45-50
- **Manonmani.M and Geetha K.T** (2012), "Wage-productivity relationship in the manufacture of leather and leather products in Tamil Nadu", Journal of Economic Policy And Research, vol 7,issue.2, Pp. 149-157.

- **Manonmani.M and. Geetha K.T** (2013)"productivity linked wage in the manufacture of paper and paper products in Tamil Nadu ",The Indian Journal of Economics, XIVC, no.372,Pp.73-88.
- **Manonmani.M** (2013), "An estimation of production function in the aggregate manufacturing sector of southern states of India in the post-reform period', Journal of Indian Research Vol.1, No.4, October-December, Pp, 36-42.
- **Manonmani.M** (2013), "An Estimation of Production Function In The Aggregate Manufacturing Sector of Southern States of India In The Post-Reform Period", Journal of Indian Research Vol.1, No.4, October-December, Pp, 36-42.
- **Manonmani. M and Ansari Begum .A (2014), "**An analysis on high technology industries in India,"– Post Graduate Thesis.
- **Manonmani . M and Suganya.D.(2014), "**An analysis on high technology industries in india, "–Post Graduate Thesis.
- **Nadakarani. P.V** (1984) "Management of co-operatives enterprises in the context of the democratic set up" Tamil Nadu Journal of Co-operation, Vol.75, No.7, Pp.372-374.
- **Nataraj and Shanthi** (2011) "The impact of trade liberalization on productivity: evidence from India's formal and informal manufacturing sectors" Journal of International Economics Vol.85,Pp. 292-301.
- **Nikham .G.A** (1976) "Financial Strength of Sugar Co-operatives - A Ratio Analysis Approach", Indian Co-operative Review, Vol.13 (2), Pp. 203.
- **O'donnell. .C.J and Christopher John O'Donnell** (2011) "The sources of productivity change in the manufacturing sectors of the U.S. economy", CEPA,working papers Series with No.07.
- **Pesala Busenna and Ramesh. V** (2012) "Andhra Pradesh manufacturing industry in the era of globalization", article provided by IUP Publications in its journal, The IUP Journal of Managerial Economics, Vol. 10,No. 1 ,Pp. 7-17.
- **Priyanka Dembla** (2000) "Production in the Indian Manufacturing Sector" cdedse.org/repec/cde/indecr/**2000**-01.rdf
- **Rajaggobal** (1995) "Organisation and management of all women coir fibre co-operatives - a study", Co-operative Perspective, Vol.30.July-September.

- **Rajan .S.S Reddy K.L.N. and Pandit. V** (2008), "Total factor productivity in selected Indian manufacturing industries", ICFAI Journal of Industrial Economics, Vol.5, No.1, Pp.51-63.
- **Rakesh Kumar** (2006) "Liberalization, efficiency, productivity and production function behaviour in Indian manufacturing sector", The Indian Journal of Economics, Vol LXXXVI, No. 3,Pp.42-58.
- **Rao.S Raghavan.P and Gupta.K** (2003) "Maharashtra's success in manufacturing", Margin, Vol. 35, No. 4, Pp. 97-110.
- **Rayudu. C .S** (1988) "Industrial co-operatives - a regional synthesis to A.P"., North Book Centre. Relations, vol.50, 2014, No.2, Pp.232-242.
- **Ronald .U Mendoza (2013)** "Balancing industrial concentration and competition for economic development in Asia: Insights from South Korea, China, India, Indonesia and the Philippines", Journal of Reviews on Global Economics, Vol.2, Pp.248-277
- **Saba vahid** (2012) "Productivity changes of the wood product manufacturing sector in the U.S.", Applied Mathematical Sciences, Vol. 2, No. 17,Pp. 799 - 816 .
- **Sandeep Kapur** (2003)"Open discussion paper, Department of Economics", University of London.
- **Sangho Kim and muthusamy Saravanakumar** (2012) "Economic reform and total factor productivity growth in Indian manufacturing industries". Vol. 16, Pp 152–166,
- **Sanjoy Saha** (2014) "Total factor productivity trends in India: a conventional approach", The NEHU Journal, Vol XII, No. 1, Pp. 95-106.
- **Santosh Kumar Sahu Krishnan Narayanan** (2011) "Total factor productivity and energy intensity in Indian manufacturing: a cross-sectional study", International Journal of Energy Economics and Policy ,Vol. 1, No. 2, Pp. 47-58.
- **Satya Prasad Padhi** (2014) "Assessing manufacturing growth in India": An Alternative Vol. 49 Pp:526-540
- **Seema Sharma .V.B Upadhyay and Balram Tyagi** (2010) "Impact of liberalisation on productivity performance of textile industry in India: a growth accounting analysis", International Journal. of Productivity and Quality Management, Vol.5, No.2, Pp.137 – 151.
- **Seema** (1999) "Paper presented on Social Development and Women Co-operative Sector",Co-operative Congress,

- **Shallu Sehgal and Suparn Sharma** (2011) "Total factor productivity of manufacturing sector in India: a regional analysis for the state of Haryana", Economic Journal of Development, Vol.13,No. 14 , Pp.97-118
- **Shireen Alazzawi** (2013) "Trade liberalization, industry concentration and female workers: the case of Egypt", Journal of Reviews on Global Economics, vol: 2, Pp.248-277
- **Soumyendra Kishore Datta** (2001-02) "An analysis of productivity trend in the in the Indian cotton mill industry", The Indian Economic Journal, Vol.49, No.2, Pp.65-72
- **Spyros Arvanitis** (2006) "Innovation and labour productivity in the Swiss manufacturing sector: an analysis based on firm panel data", KOF working papers with No. 06-149.
- **Sri Poorni R.S and Manonmani.M** (2014) " Efficiency in urban manufacturing: an application of DEA",International Journal of Social Science & Interdisciplinary Research Vol.3, Pp. 225-236
- **Sri Poorni R.S and Manonmani.M** (2014) "Measurement of productive Efficiency – AtStochastic Frontier Production Function Approach to Indian Industries ", Journal of International Academic Research For Multidisciplinary Vol: 2, Pp. 361-371.
- **Sri Poorni R.S and Manonmani.M** (2014) "Determinants of industrial profitability before and after liberalization in Tamil Nadu - An Application of Discriminant Function", ZENITH International Journal of Business Economics & Management Research , Vol.4 ,Pp. 7-11
- **Sri Poorni R.S and Manonmani.M** (2014)"Factors influencing total factor productivity across the southern states of India - An Application of Discriminant Function", International Journal of Commerce, Business and Management (IJCBM), Vol. 3, No. 4,Pp.623-625
- **Sunil Kumar** (2001) "Explaining Inter-state differentials in total factor productivity growth in Indian manufacturing sector", Vol LXXXII, No. 325.
- **Susan. J Linz** (2000) "Labour productivity in transition: a regional analysis of Russian industry", Economic Development and Cultural Change, Vol.48, No. 4, Pp. 685-718.
- **Tarlok Singh** (2000) "Total productivity in the manufacturing industries in India", The Indian Economic Journal, Vol.48, No.2, Pp.108-117.

- **Unel Bulent** (2003) “Productivity trends in India's manufacturing sectors in the last two decades”, IMF working paper No.02, Pp.33.
- **Upender and Mulakala Upender** (2009) “Elasticity of substitution between labour and capital across twenty six major industries in India during 2004-05”, International Journal of Applied Econometrics and Quantitative Studies ,Vol. 9,No. 1 ,Pp. 101-11.
- **Vijayachandran Pillai** (1998) "Financial problems of rural coir co-operatives-a case study" Kurukshetra, Vol.66, No.5, Pp.47-50.

APPENDICES

APPENDIX-I

(Value Figures in Rs.Lakhs & Others in Numbers)

Year	Factories	Fixed Capital	Workers	Total Workers Engaged
2001-02	2048	907905	212970	309205
2002-03	1806	893831	179204	263226
2003-04	2132	857324	193398	284068
2004-05	2009	901520	179254	256134
2005-06	2046	1349382	192265	269459
2006-07	2146	1355879	199350	280207
2007-08	1953	1458663	197441	272963
2008-09	1414	1370525	166907	229083
2009-10	1946	1770991	202362	276989
2010-11	2040	1803972	198836	273054
2011-12	2017	2003440	202178	280158
2012-13	2054	2352488	200100	275796
2013-14	1919	2552652	186361	254464

Source: Annual Survey of Industries

APPENDIX-2

(Value Figures in Rs. Lakhs & others in Numbers)

Year	Wage To Workers	Total Emoluments	Total Inputs	Total Output	Net value Added
2001-02	113240	206545	2578659	3092578	426323
2002-03	88872	174843	2415234	2849338	351206
2003-04	97795	190436	2384602	2714869	239511
2004-05	96077	189983	2646164	3073937	336789
2005-06	111515	219552	3554453	4280661	640089
2006-07	119660	229720	3844540	4671629	719569
2007-08	135637	261440	4205500	4784495	462816
2008-09	118083	238005	4795898	5428322	517389
2009-10	163196	345081	6228832	7000369	635197
2010-11	201352	405461	7262689	8154012	751038
2011-12	221482	443868	8754928	9828548	927064
2012-13	249832	500272	9508177	10651277	964271
2013-14	250483	443868	9966263	11303270	1140362

Source: Annual Survey of Industries